

APPENDIX 16

**Petrographic Report, Sidewinder #1-H well,
Union Pacific Resources**

Thin Section Analysis for:
UPR
Sidewinder 1H
2-19N-97W
Sweetwater Co., Wyo.
Frontier Fm.

5/1/00 B.R.

**Thin Section Analysis for:
UPR
Sidewinder 1H
2-19N-97W
Sweetwater Co., Wyo.
Frontier Fm.**

5/1/00 B.R.

Depths	15960 1'
	15965 2'
	15969 1'
	15973 1'
	15976 1'
	15980 1'
	15984 2'
	15993.2'
	15998 1'
	16002 1'
	16004 1'
	16005 4'
	16009 2'
	16015 2'

Sidewinder Unit 1H

15960.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 87.8%, plagioclase 2.9%, total clays 9.3%

Grain Size = Very Fine (62-125 μ)

Subangular and subrounded grains

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .003md perm Porosity = 9.4%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.003md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

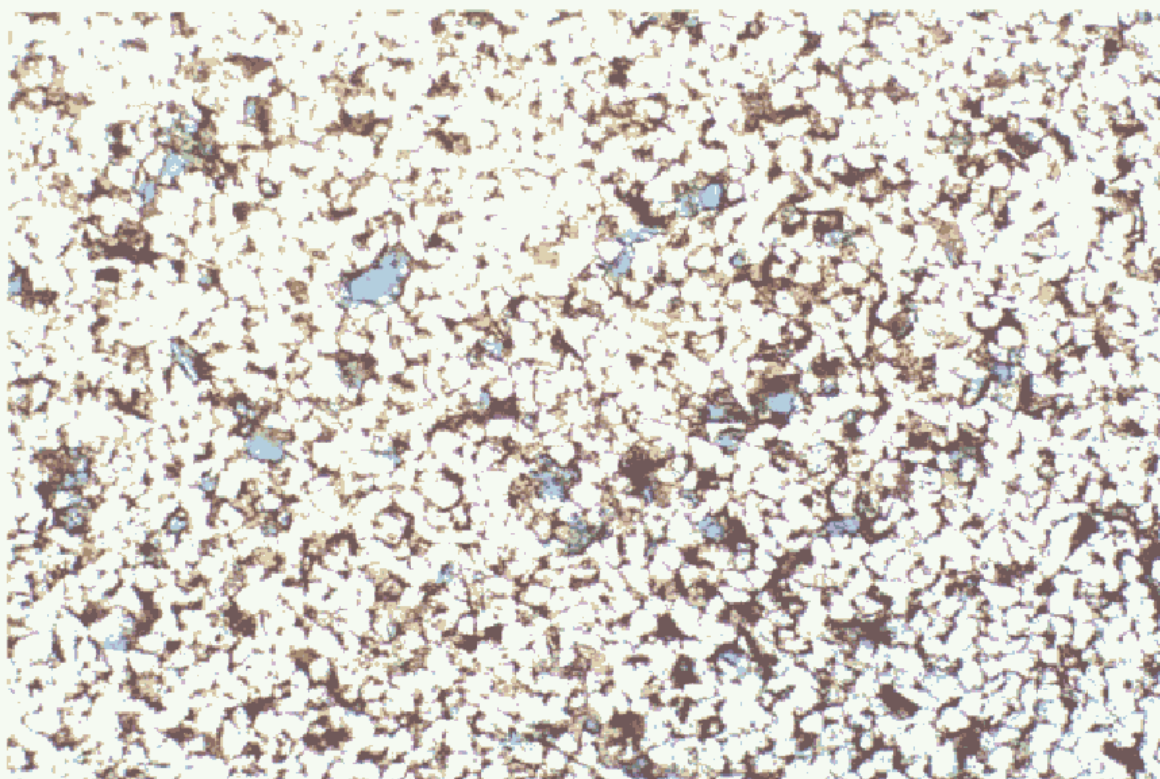
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

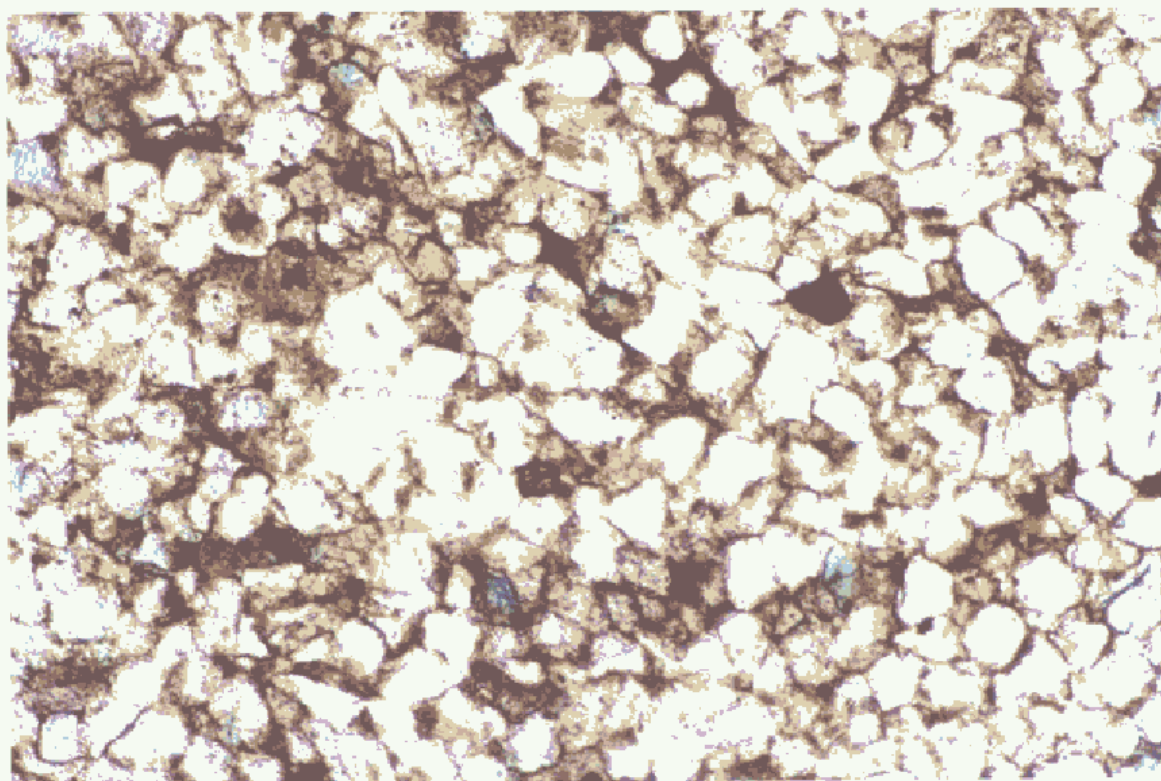
Sidewinder Unit #1H

15960.1'

A

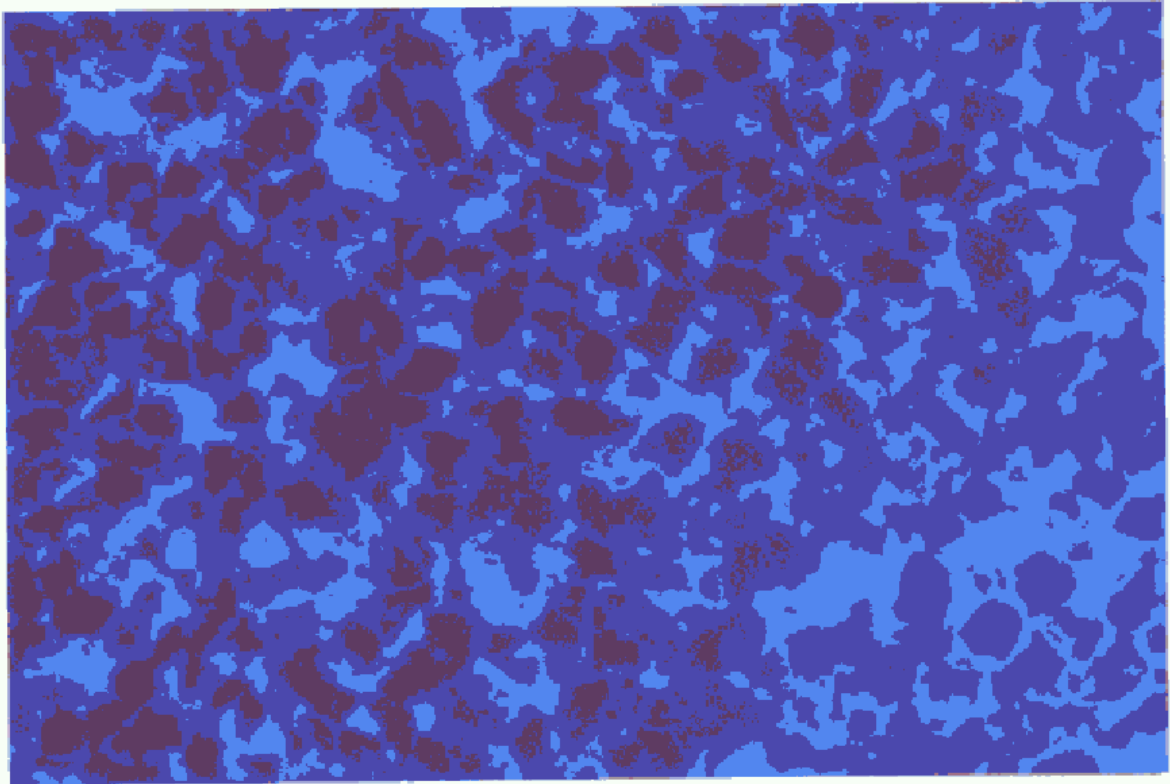


B



Sidewinder Unit #1H

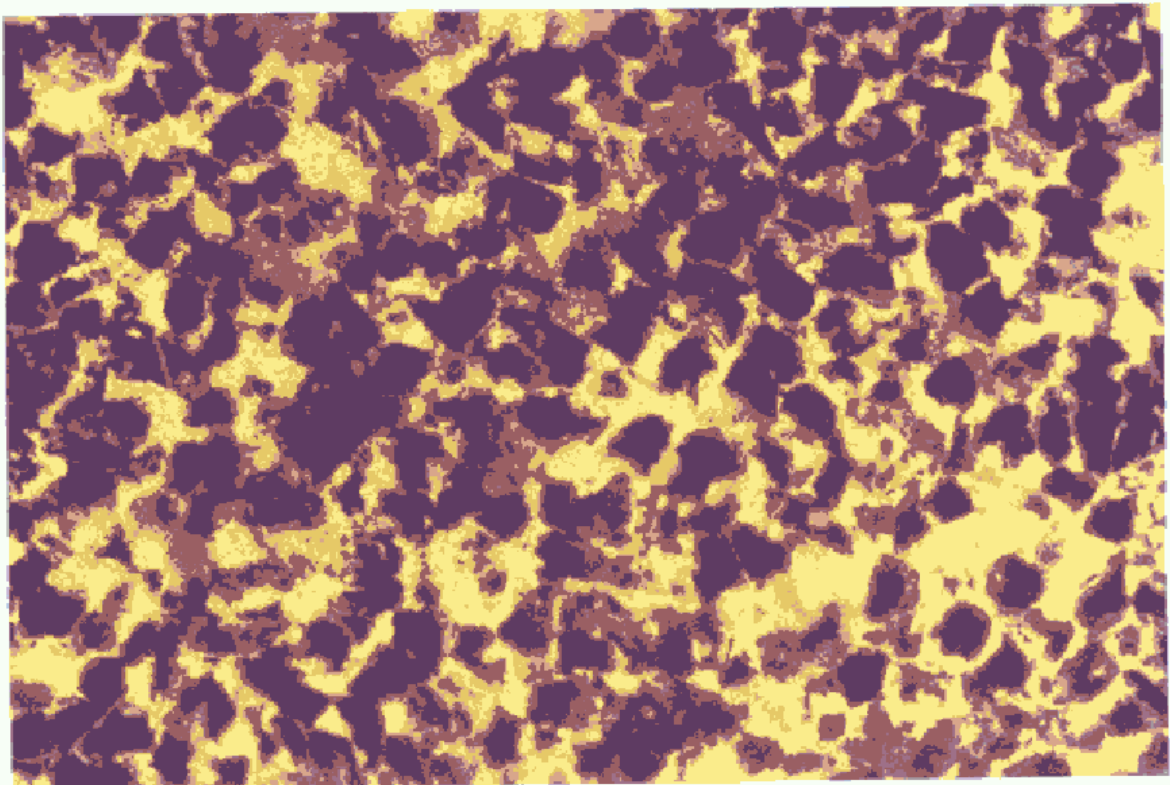
15960.1'



X-N

0 125μ

C



E-F

0 125μ

D

Sidewinder Unit 1H

15965.2'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 87.9%, plagioclase 3.2%, total clays 8.9%

Grain Size = Very Fine (62-125 μ)

Subangular and subrounded grains

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .004md Porosity = 11.3%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.004md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

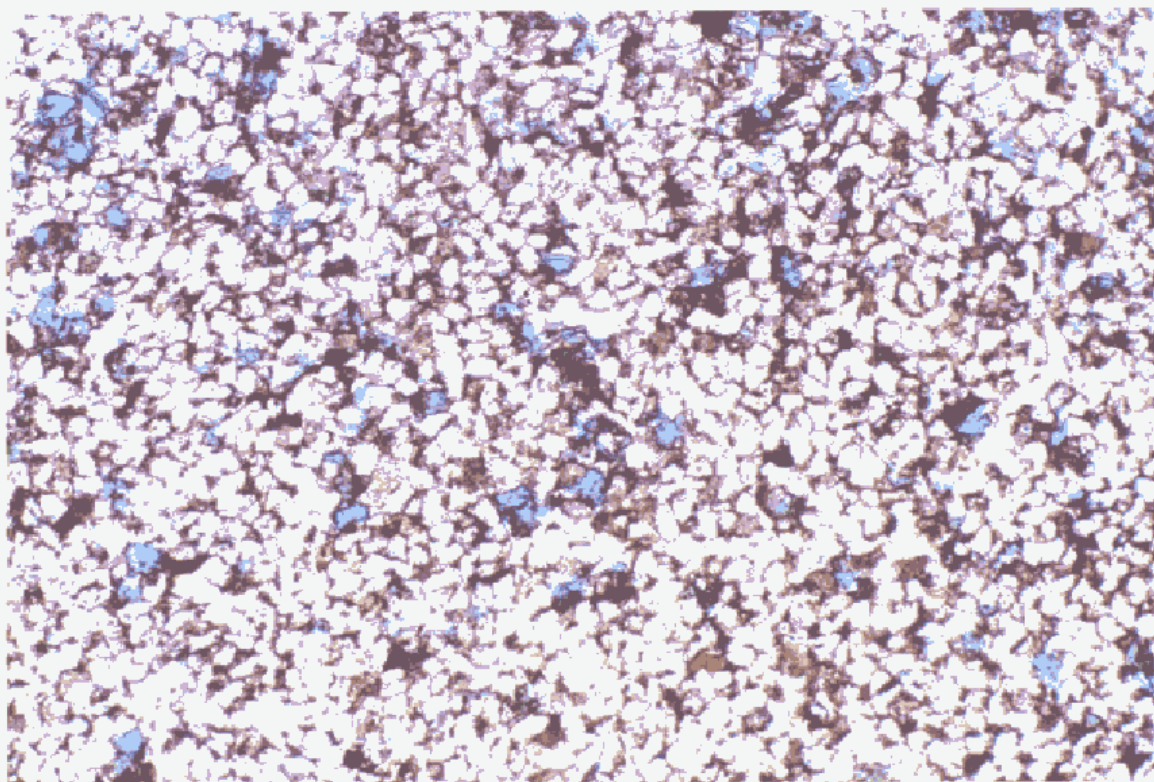
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

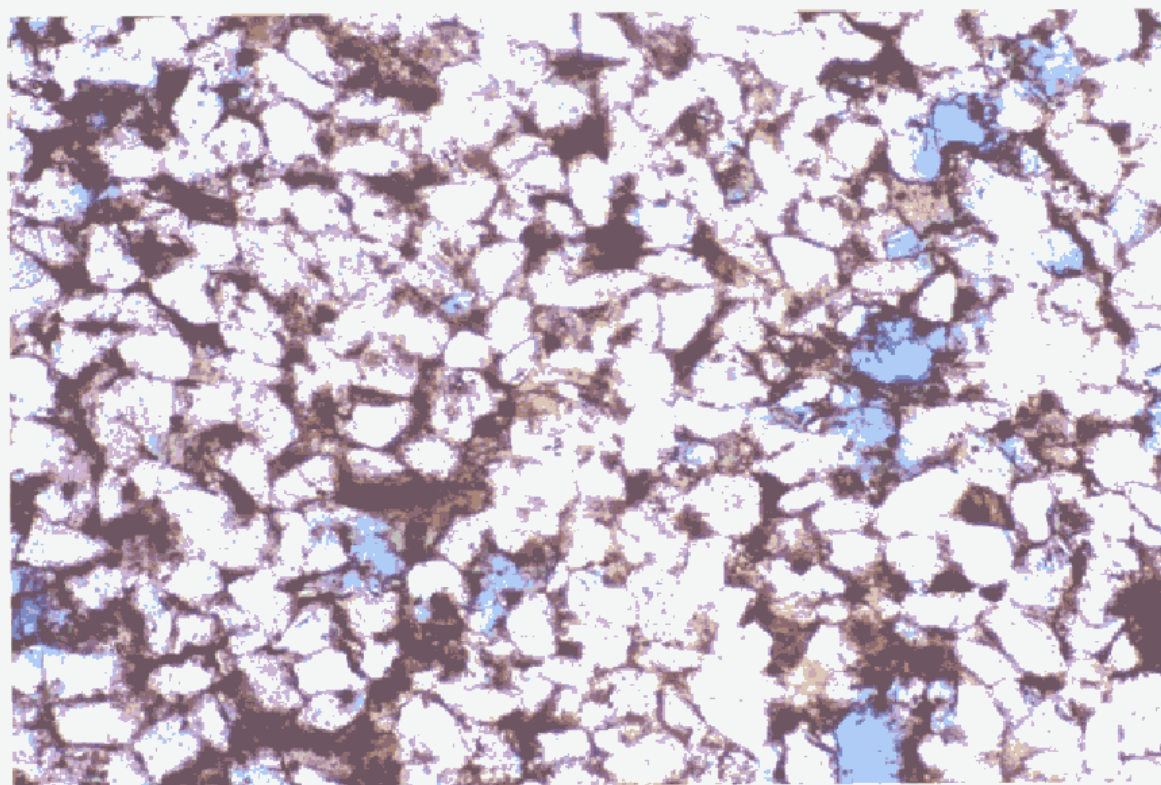
15965.2'

A



0 500μ

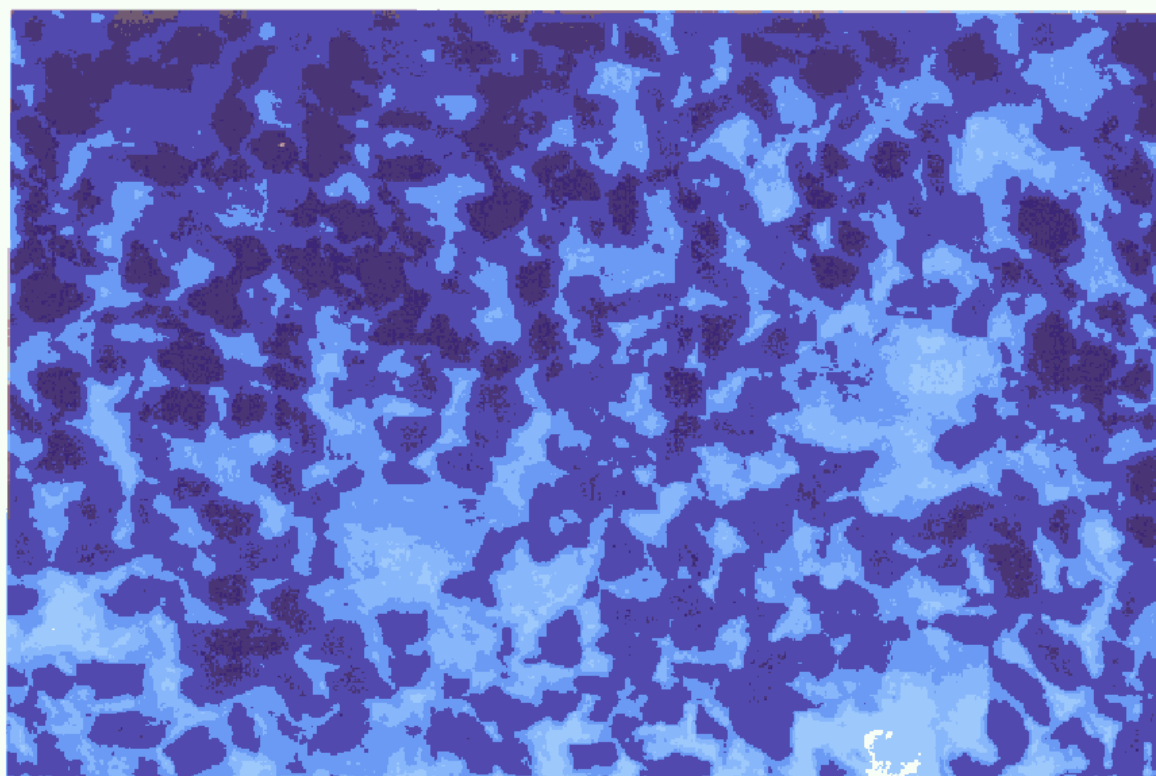
B



0 125μ

Sidewinder Unit #1H

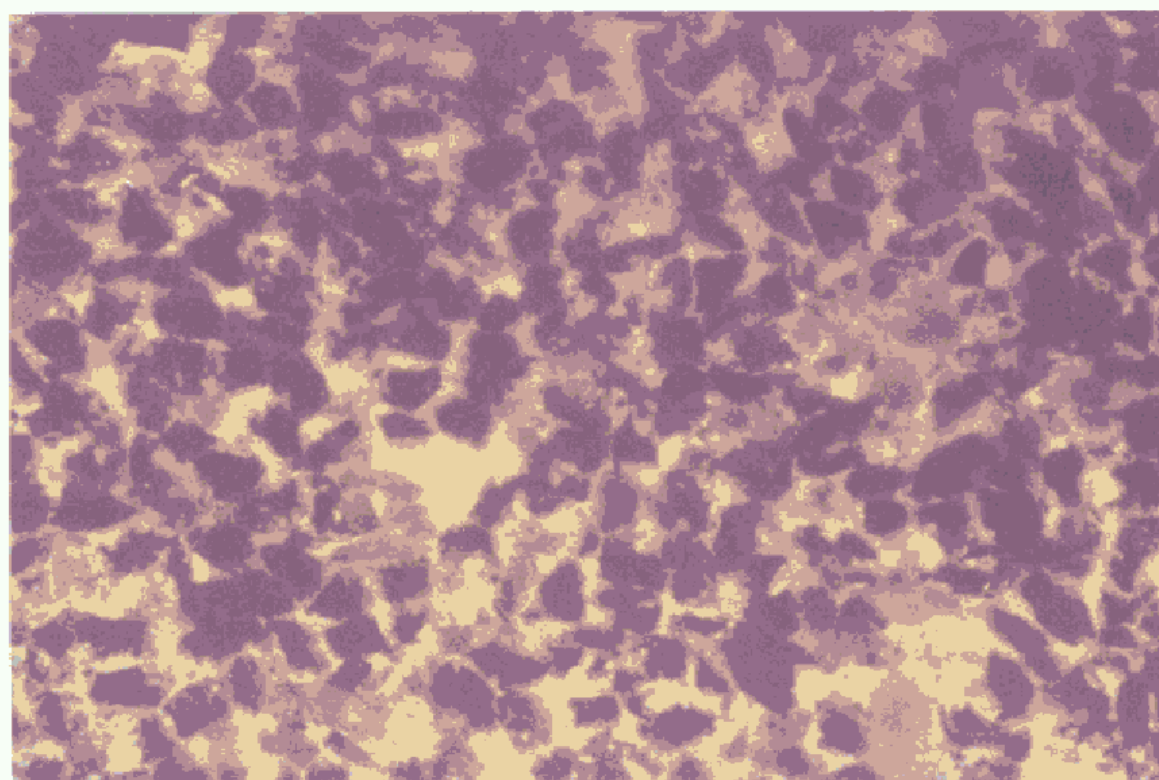
15965.2'



C

UV

0 125μ



D

E-F

0 125μ

Sidewinder Unit 1H

15969.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 87.6%, plagioclase 3.4%, total clays 9%

Grain Size = Very Fine (62-125 μ)

Subangular and subrounded grains

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .005md Porosity = 10.9%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.005md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

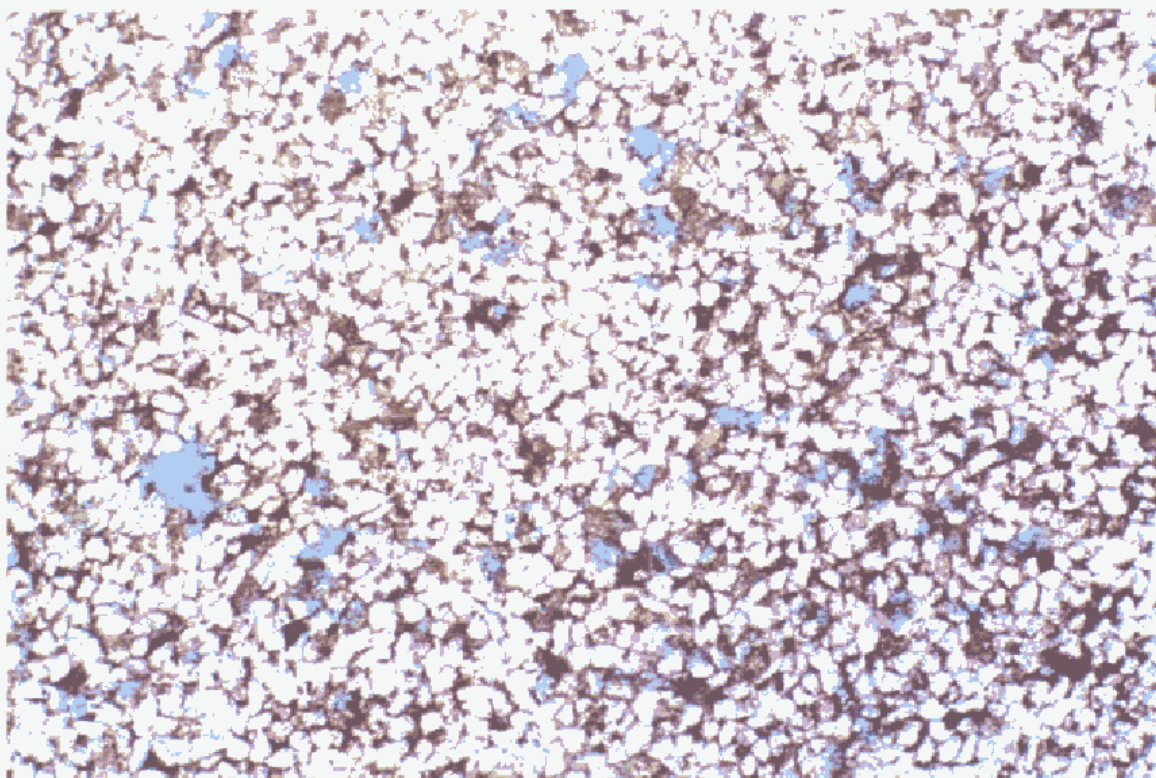
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

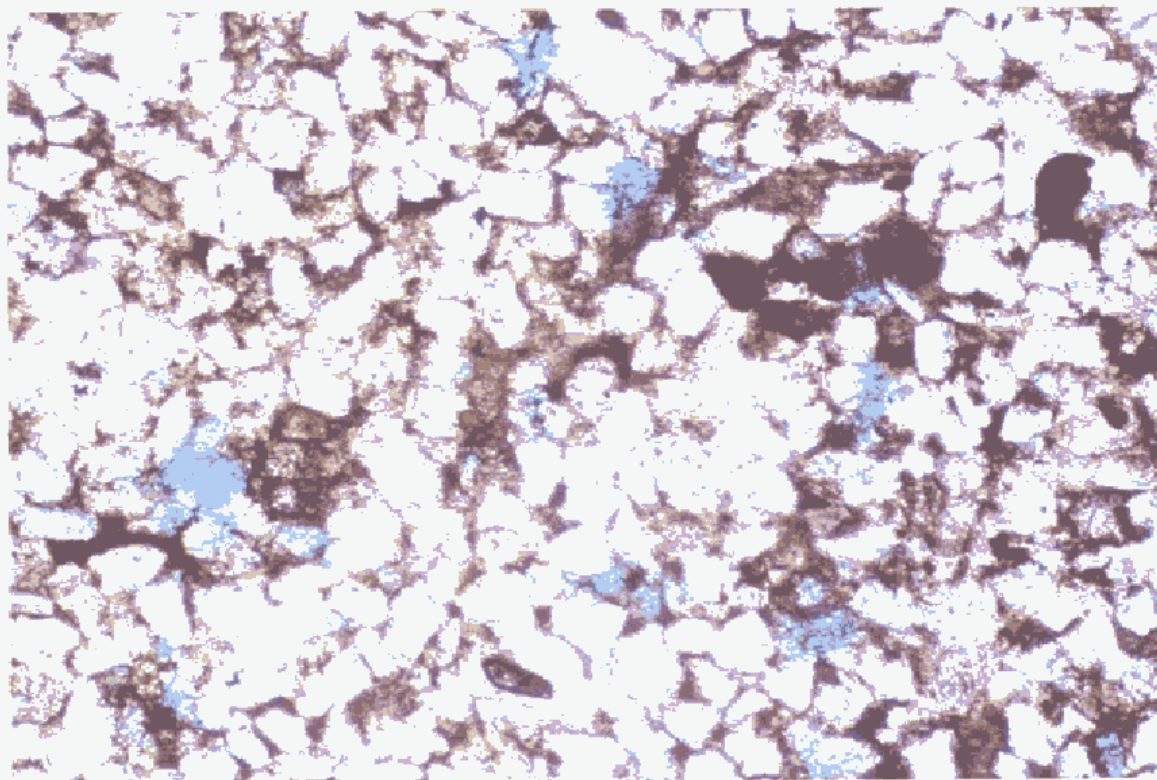
15969.1'

A



0 500 μ

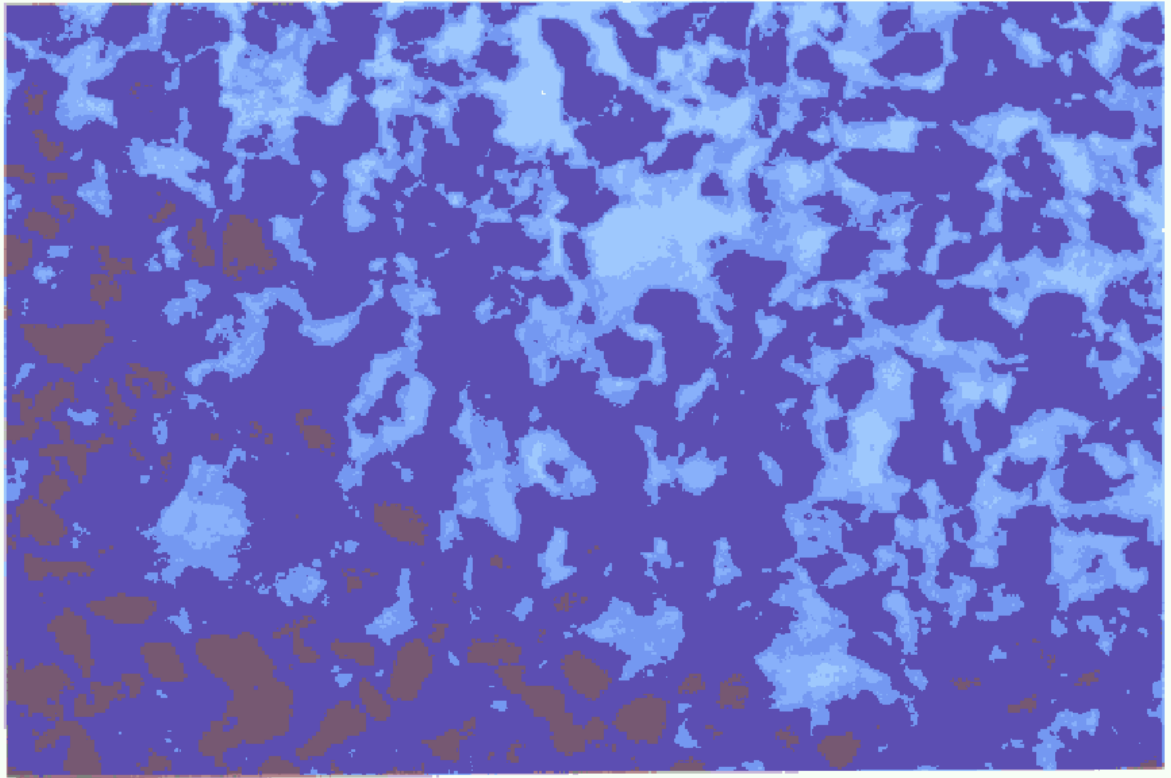
B



0 125 μ

Sidewinder Unit #1H

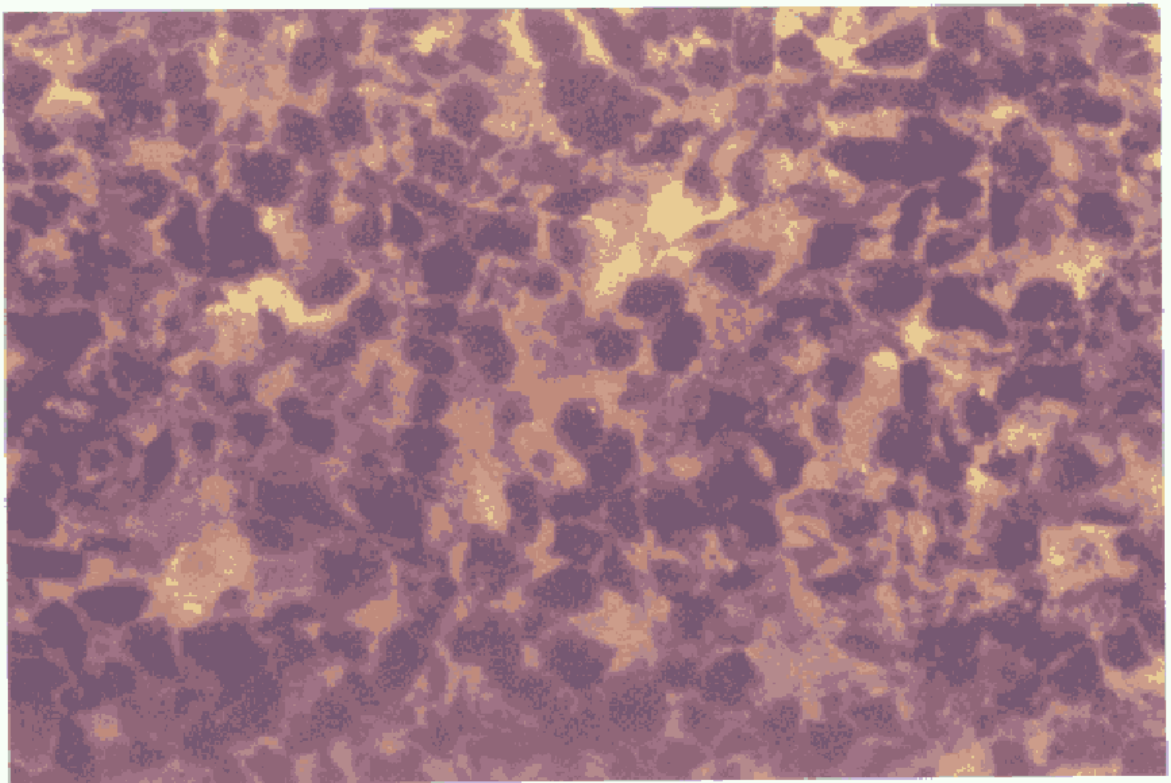
15969.1'



C

UV

0 125µ



D

E-F

0 125µ

Sidewinder Unit 1H

15973.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 88.7%, plagioclase 2.8%, total clays 8.5%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .004md Porosity = 10.6%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.004md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

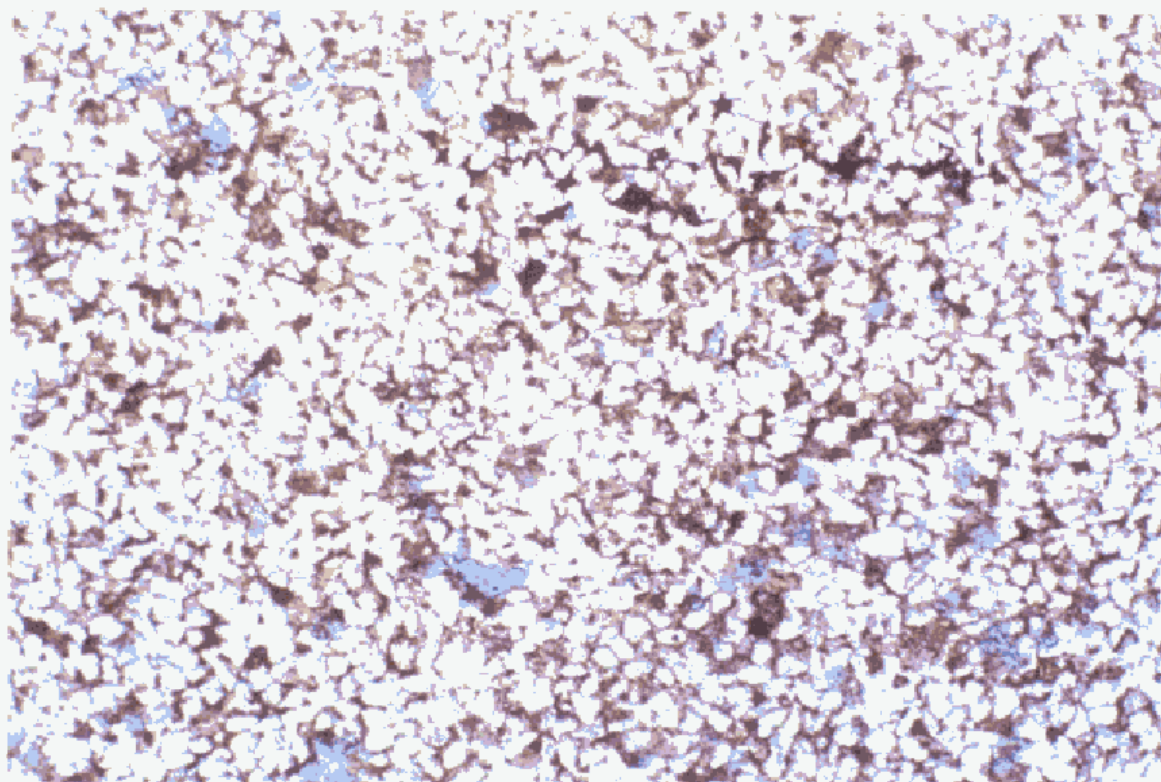
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

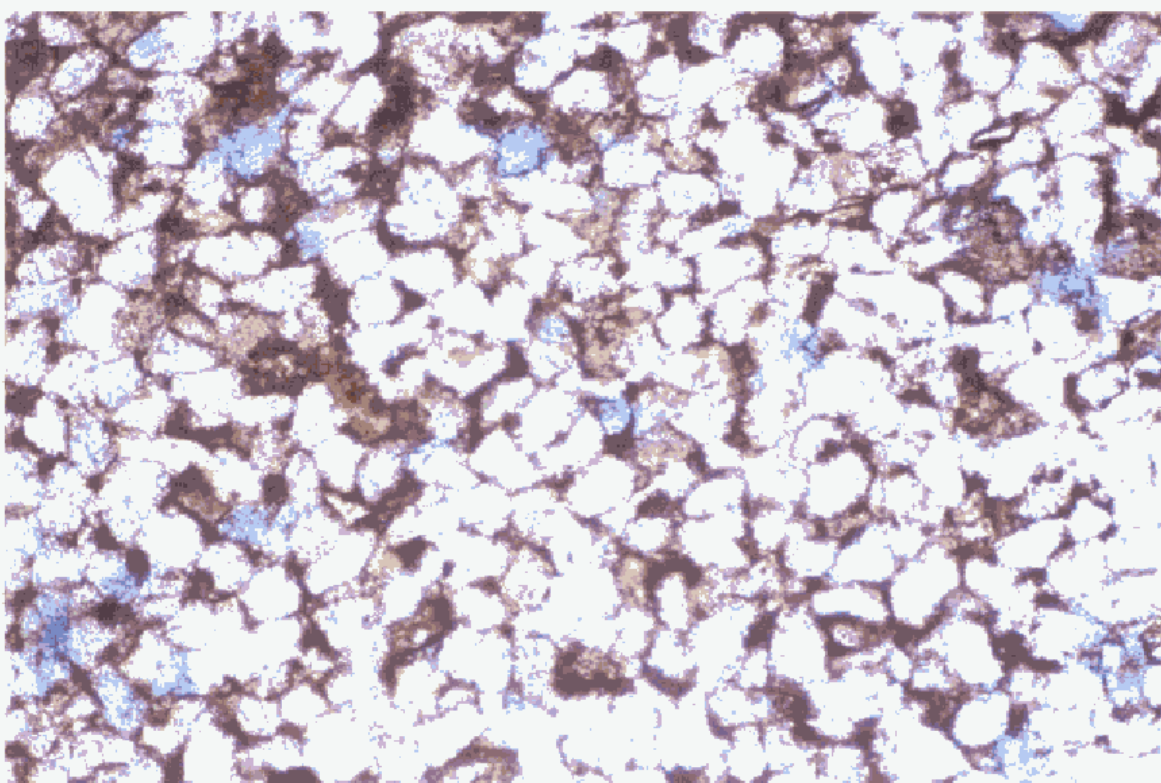
15973.1'

A



0 500μ

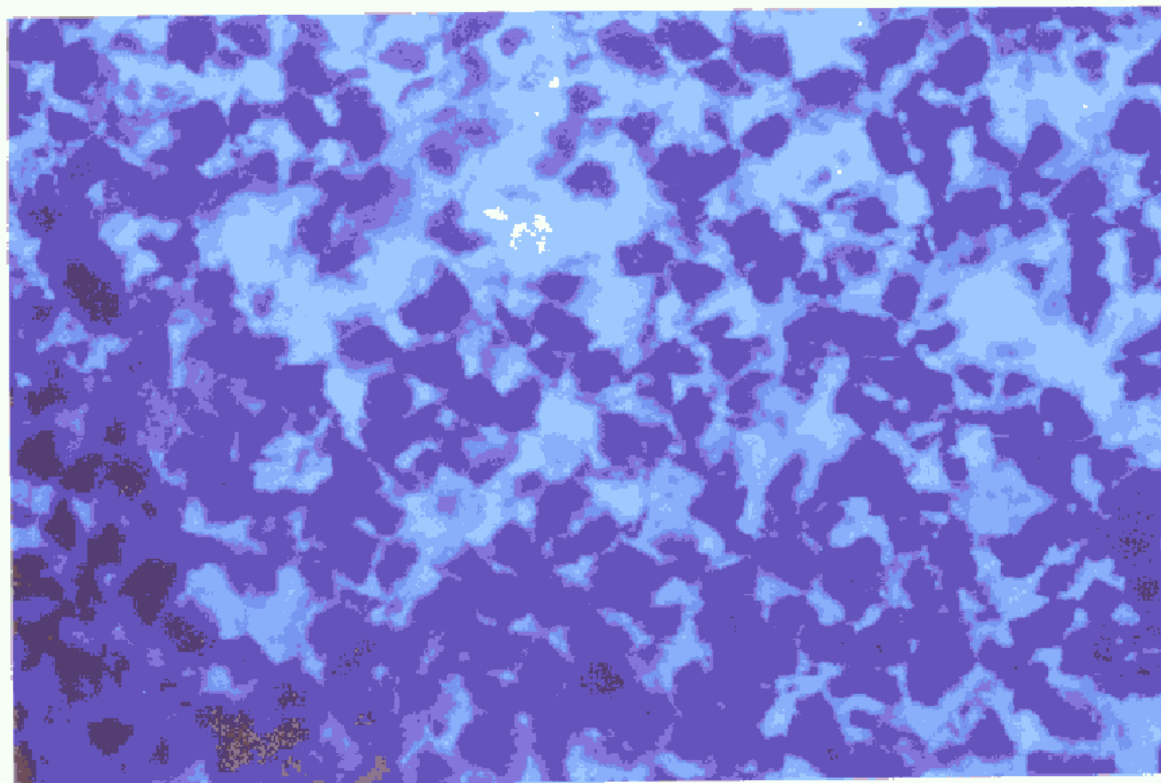
B



0 125μ

Sidewinder Unit #1H

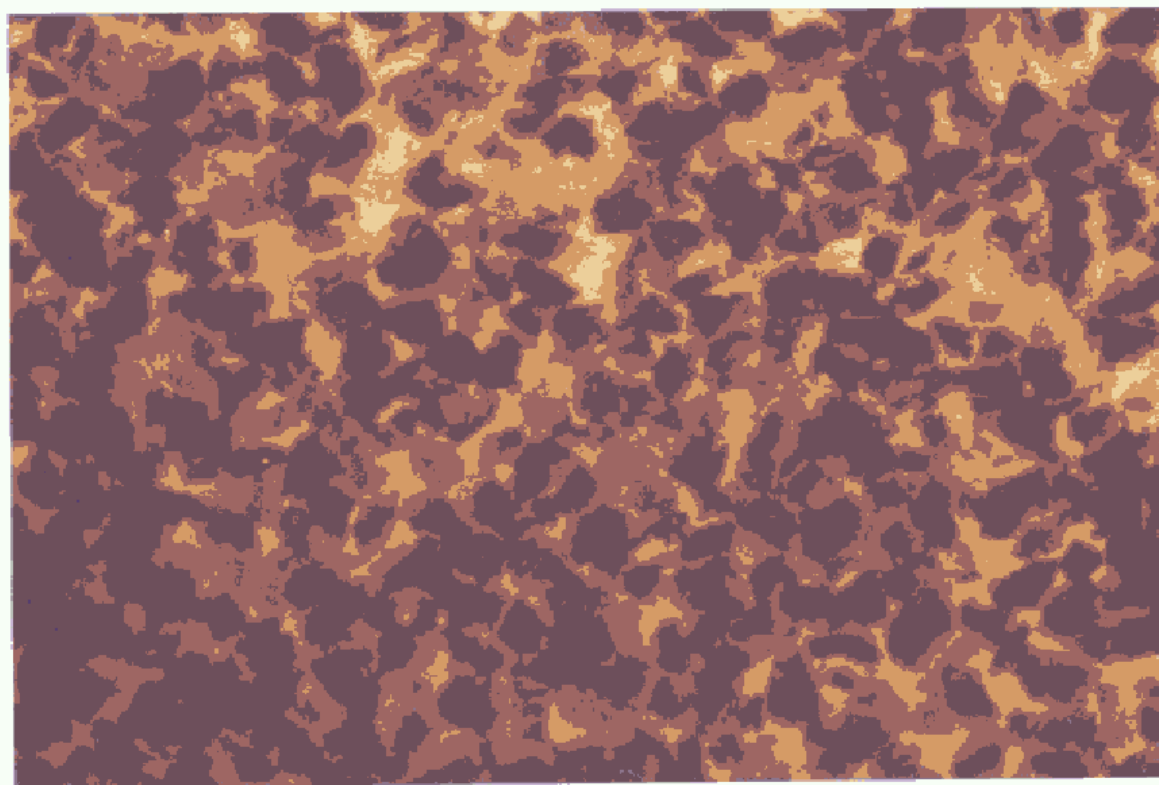
15973.1'



C

UV

0 125μ



D

E-F

0 125μ

Sidewinder Unit 1H

15976.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 88.1%, plagioclase 2.3%, total clays 9.6%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .005md Porosity = 11.7%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.005md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

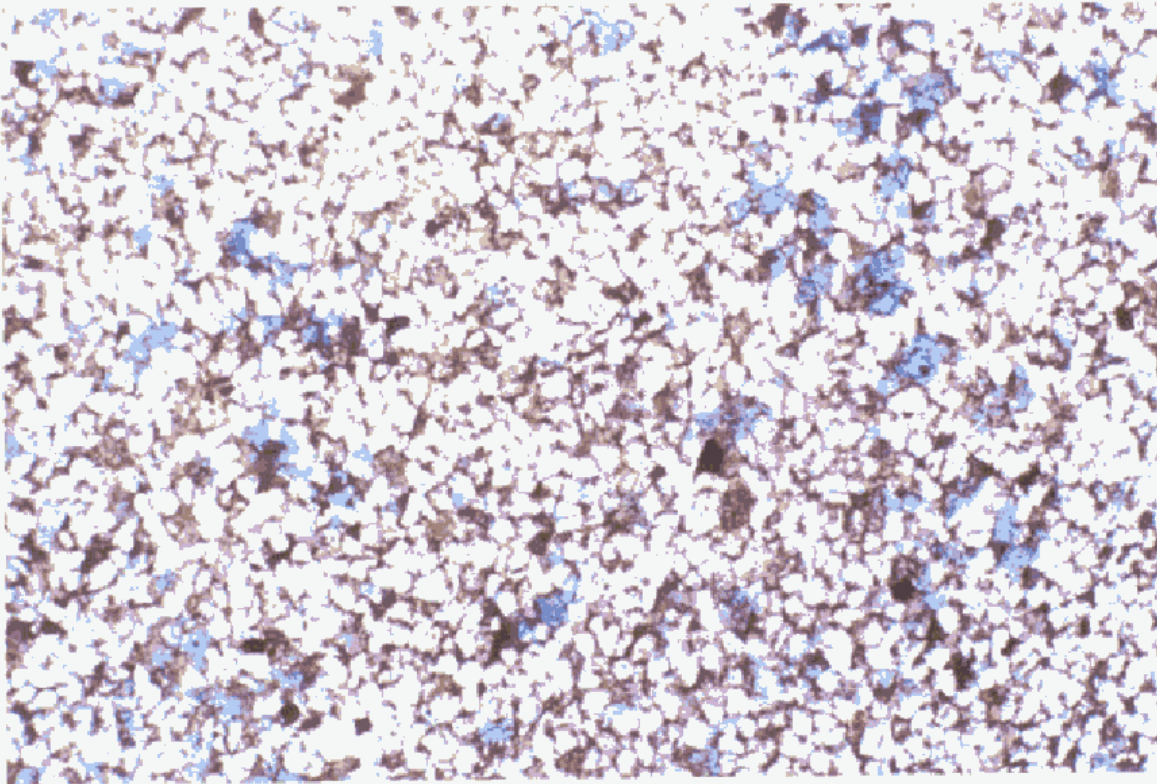
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

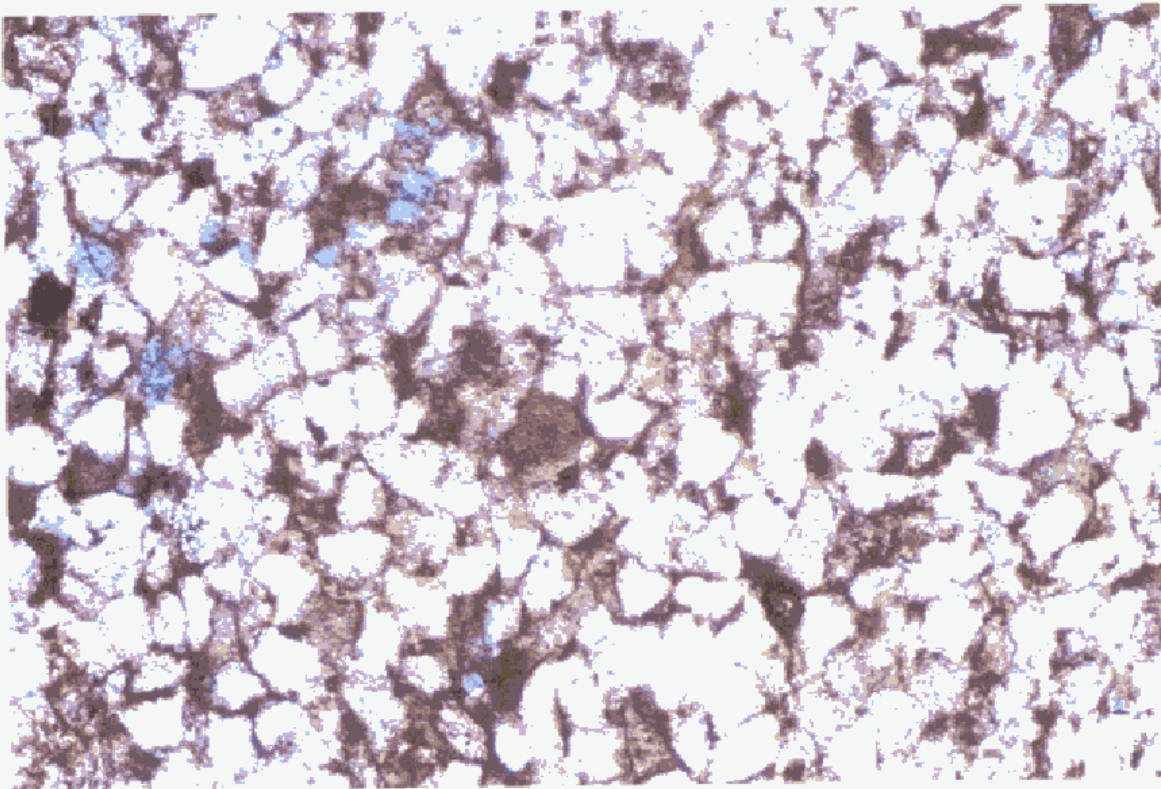
15976.1'

A



0 500μ

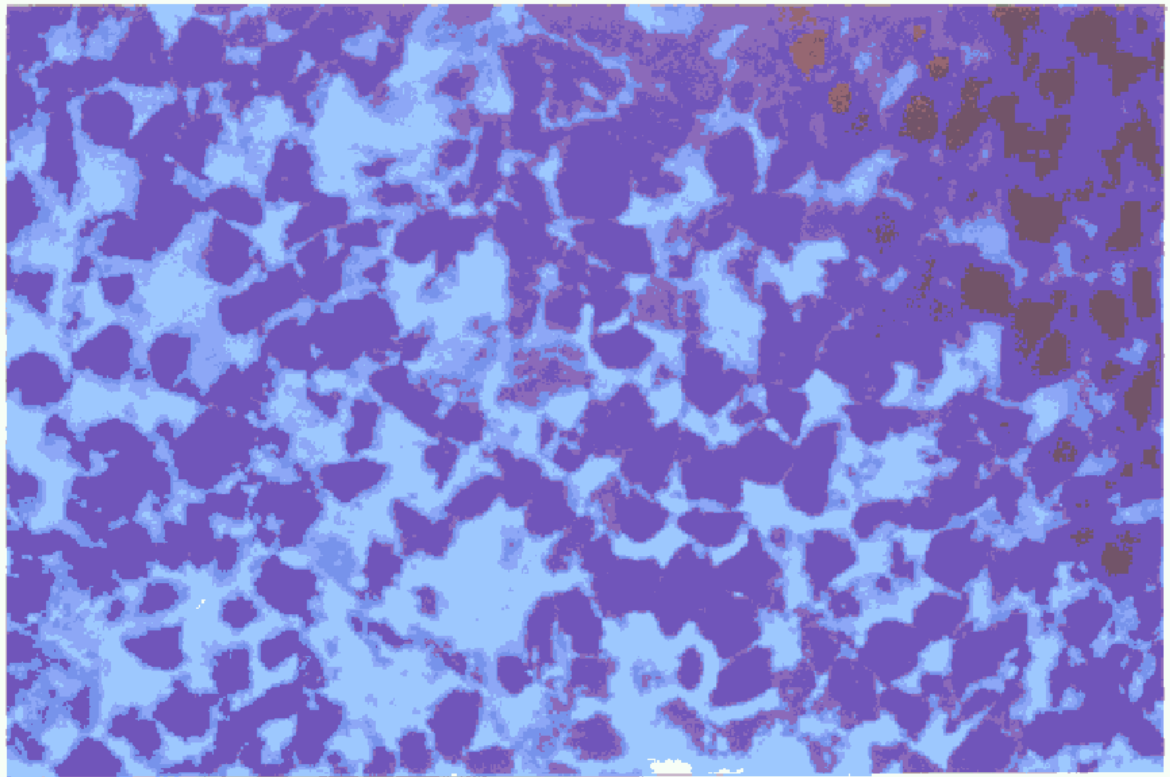
B



0 125μ

Sidewinder Unit #1H

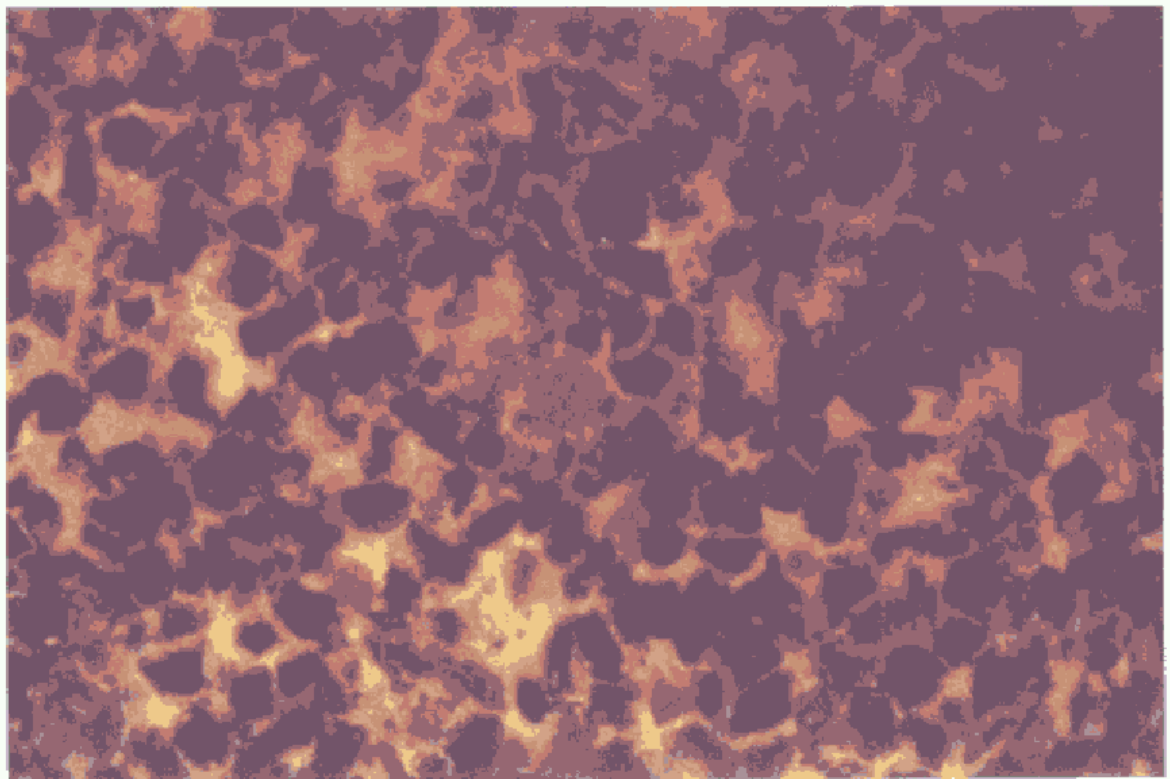
15976.1'



C

UV

0 125µ



D

E-F

0 125µ

Sidewinder Unit 1H

15980.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 87.7%, plagioclase 2.8%, total clays 9.5%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .002md Porosity = 10.0%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.002md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

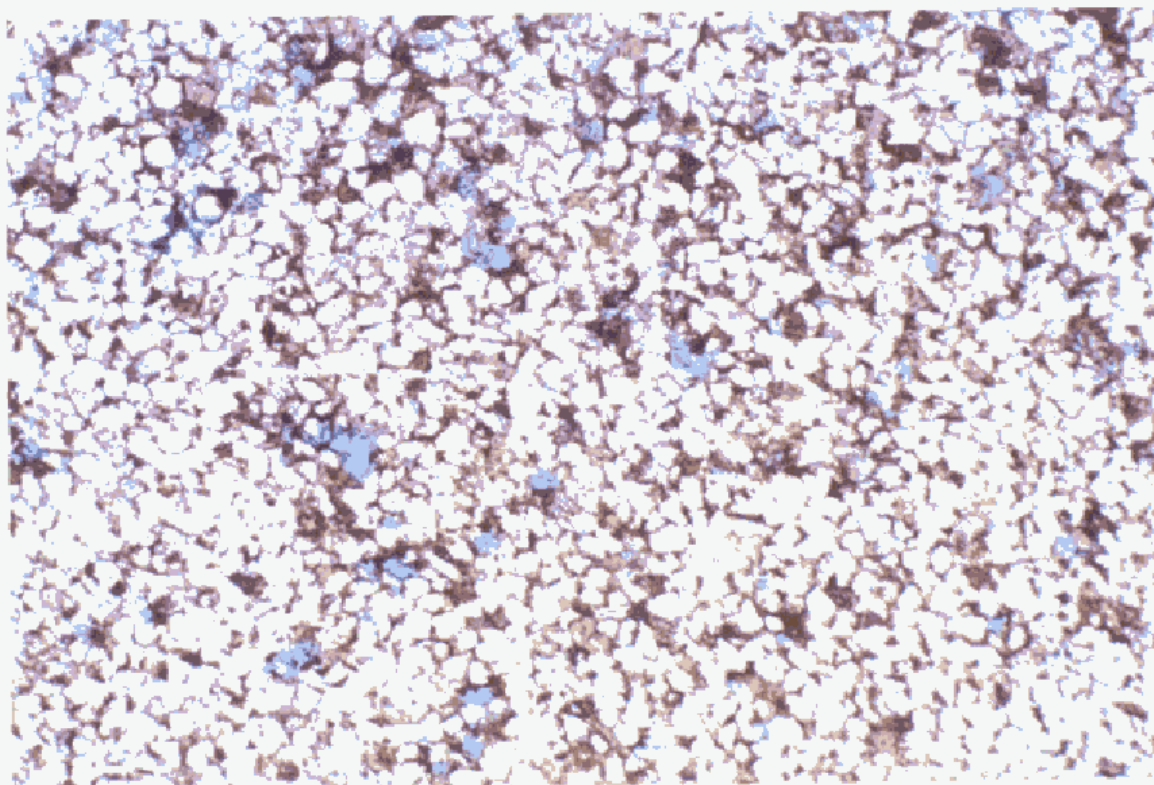
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

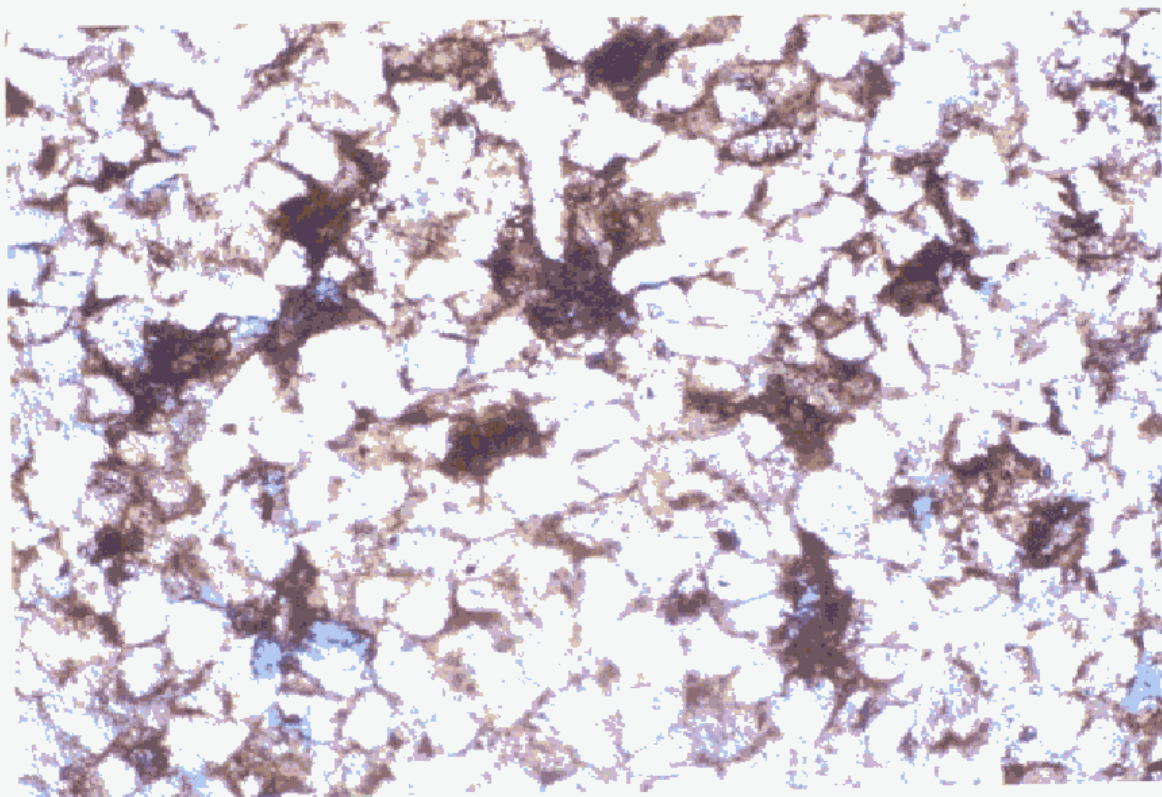
15980.1'

A



0 500μ

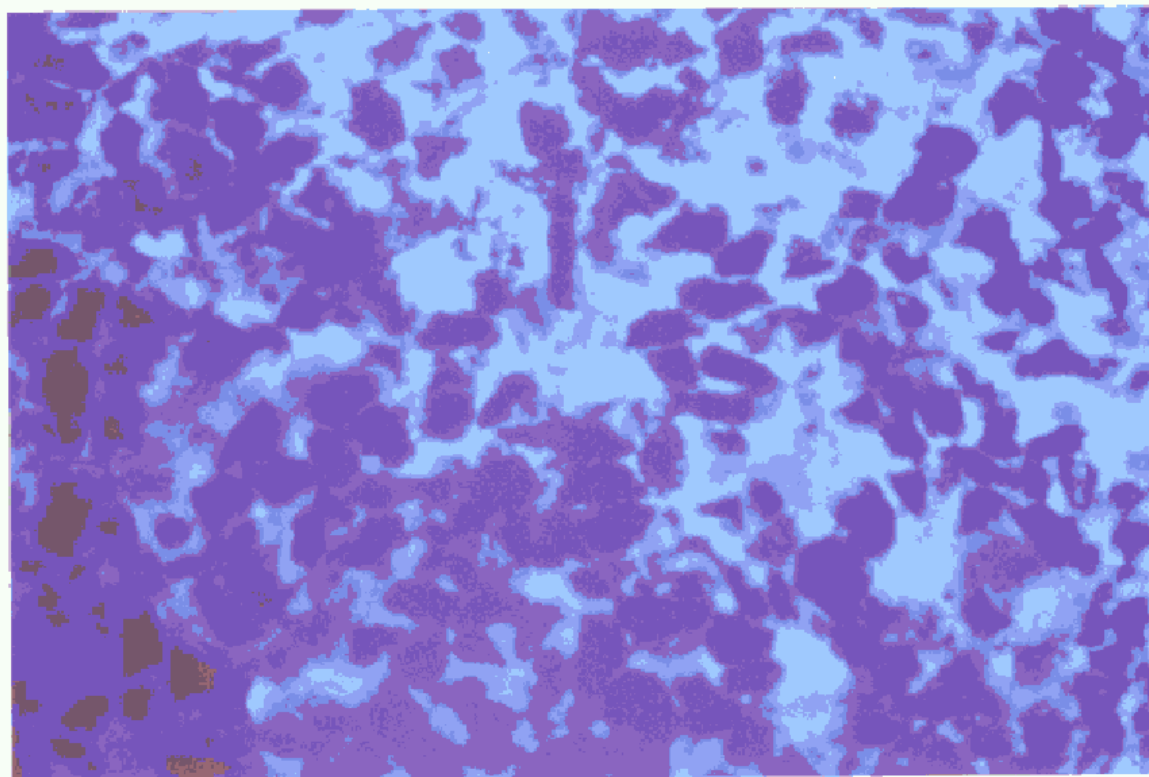
B



0 125μ

Sidewinder Unit #1H

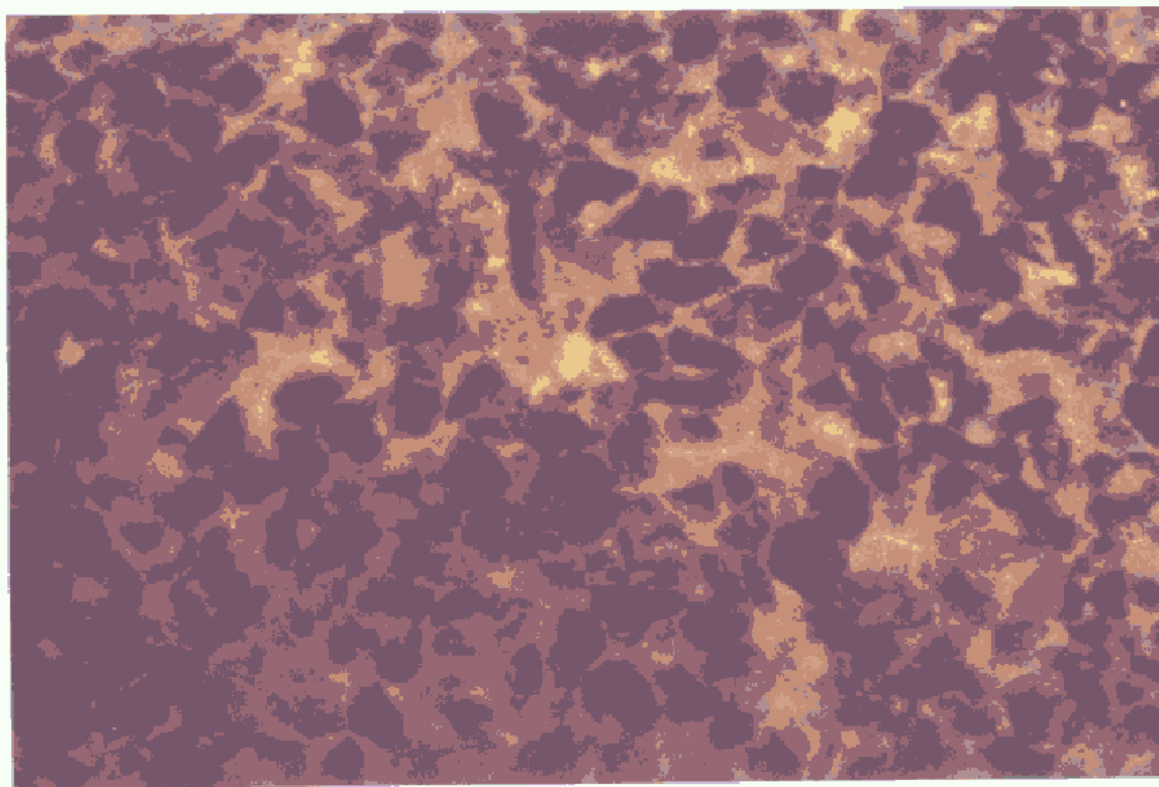
15980.1'



UV

0 125μ

C



E-F

0 125μ

D

Sidewinder Unit 1H

15984.2'

Massive sandstone with small mud drapes

Sublithic arenite

X-Ray Diffraction: quartz 88.5%, plagioclase 2.4%, total clays 9.1%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .005md Porosity = 11.0%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.005md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

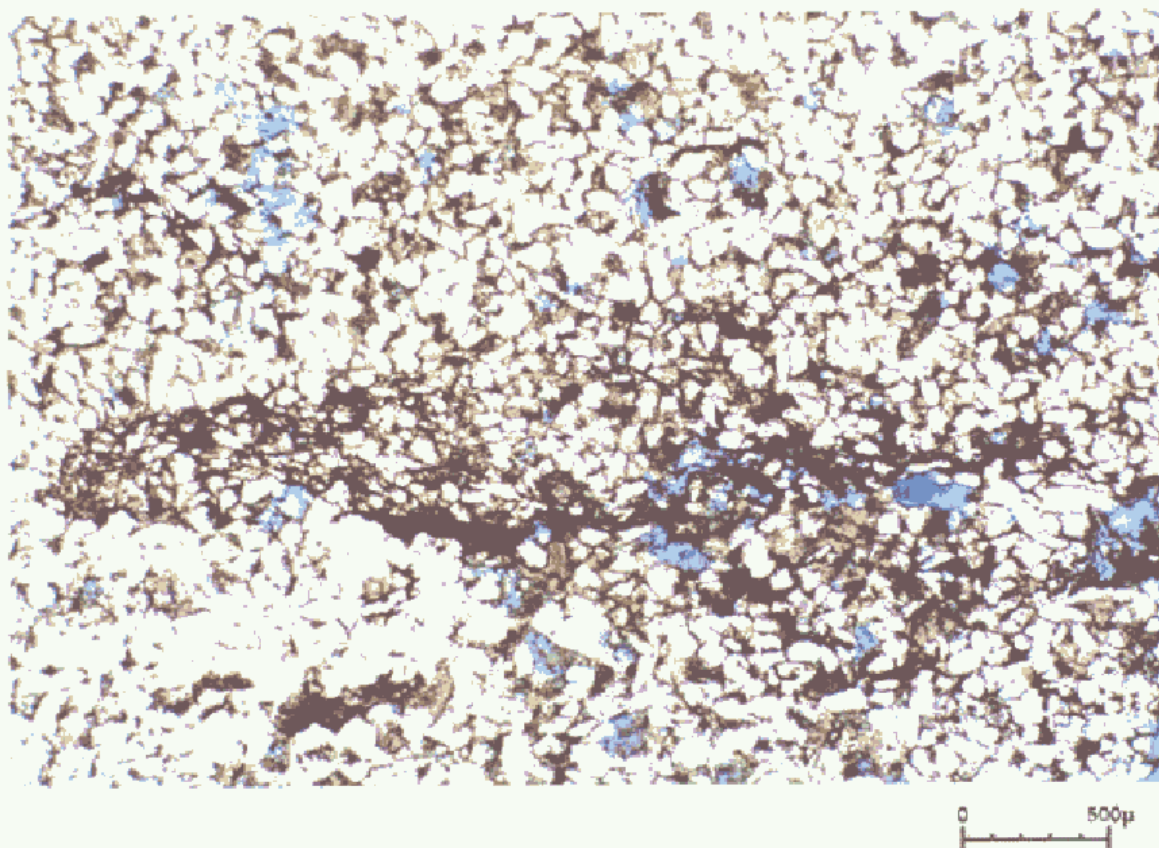
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence. The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

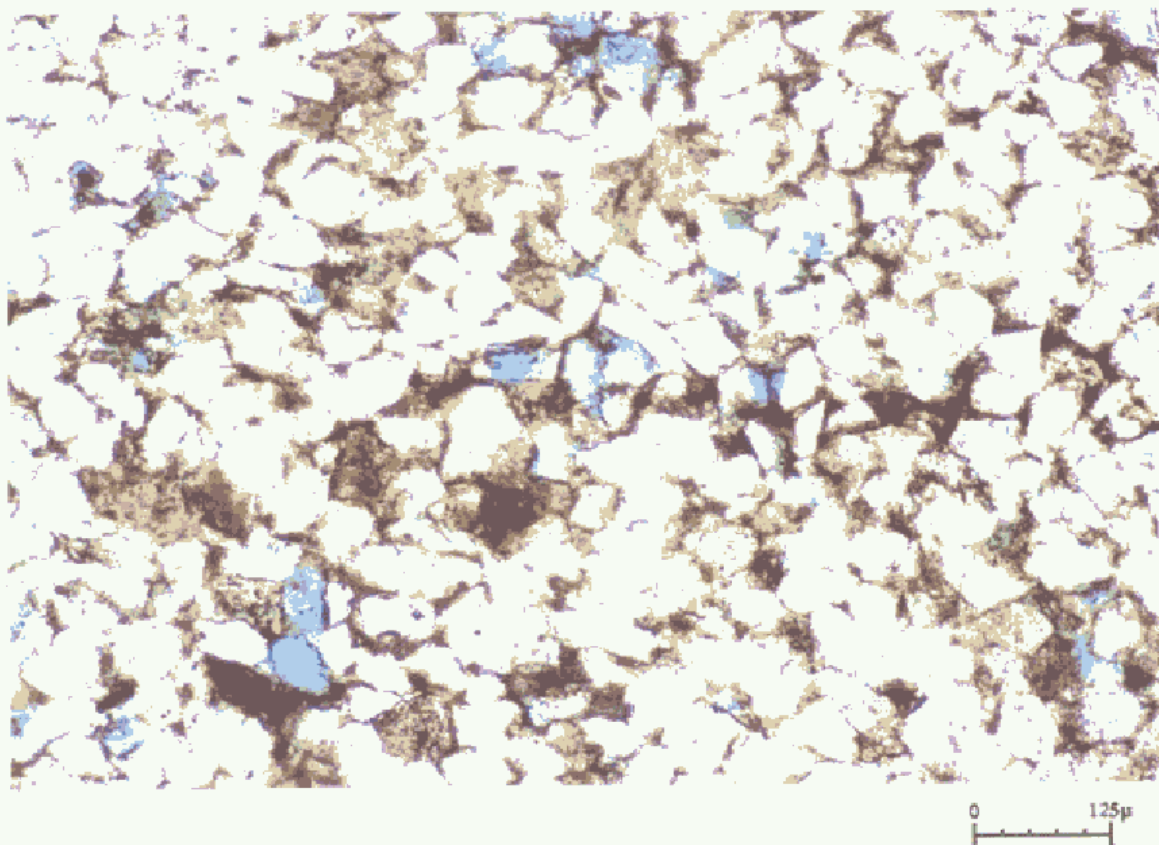
Sidewinder Unit #1H

15984.2'

A

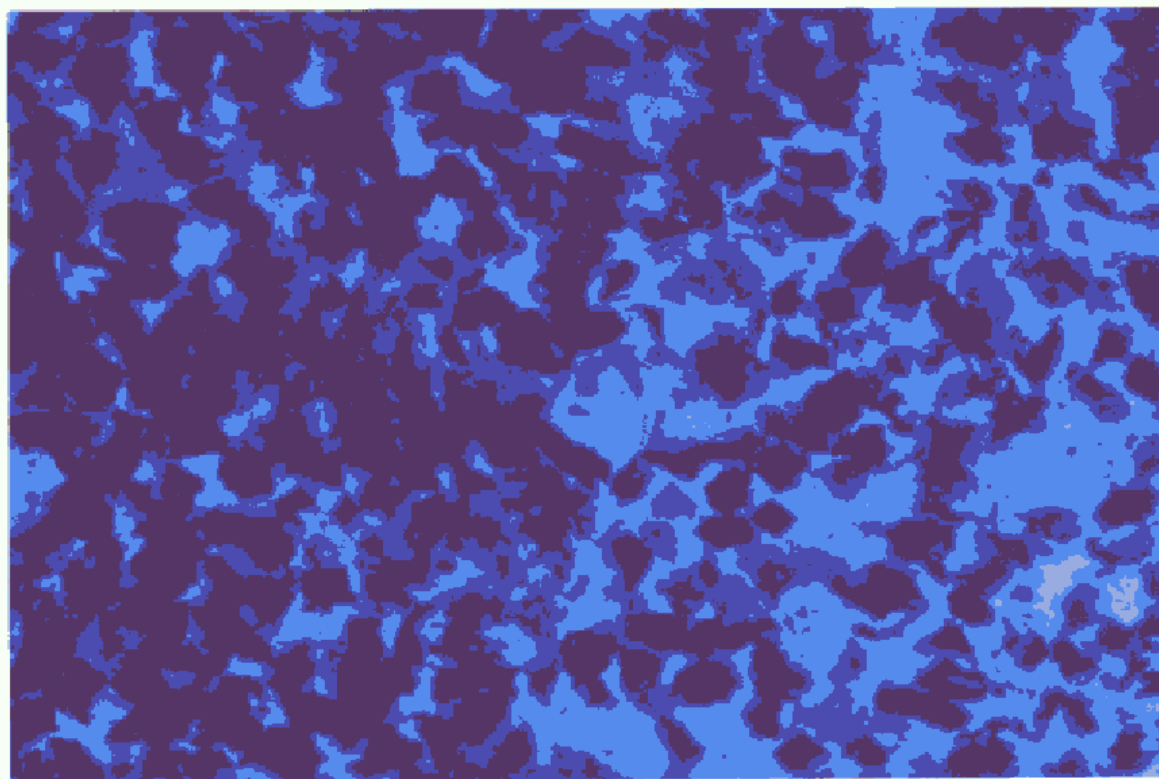


B



Sidewinder Unit #1H

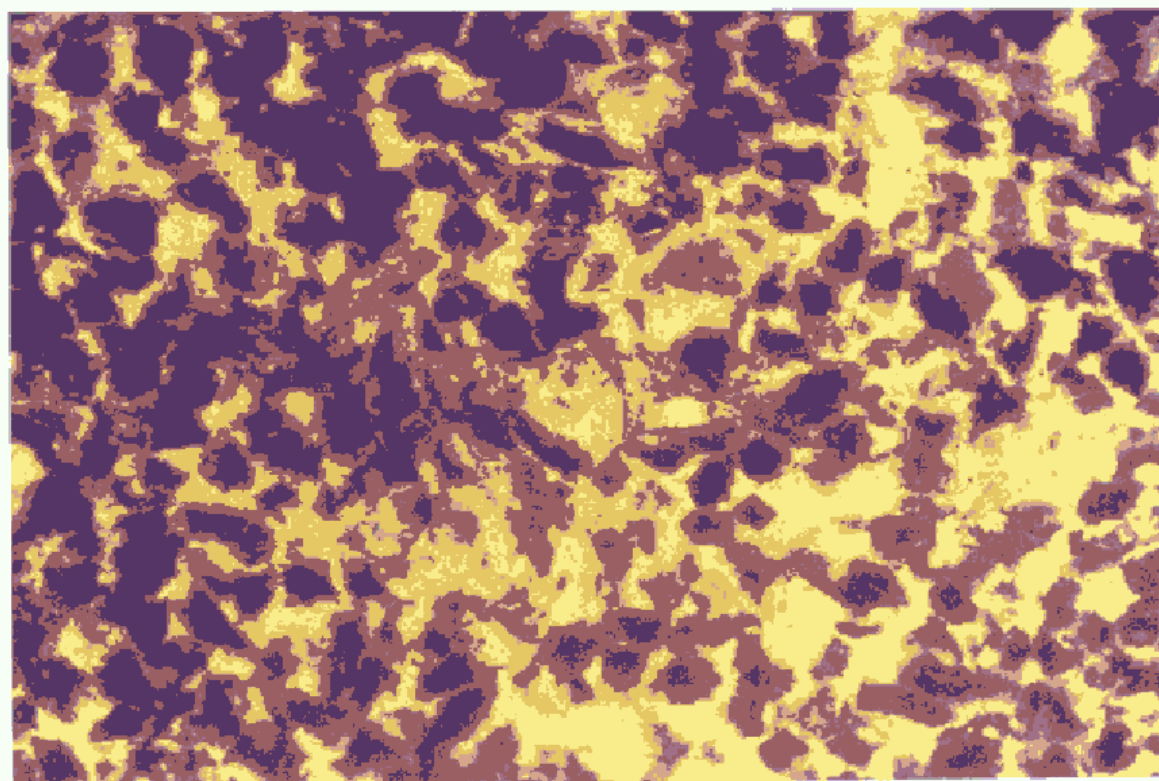
15984.2'



X-N

0 125μ

C



E-F

0 125μ

D

Sidewinder Unit 1H

15993.2'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 89.5%, plagioclase 2.7%, total clays 7.8%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .005md Porosity = 11.4%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.005md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

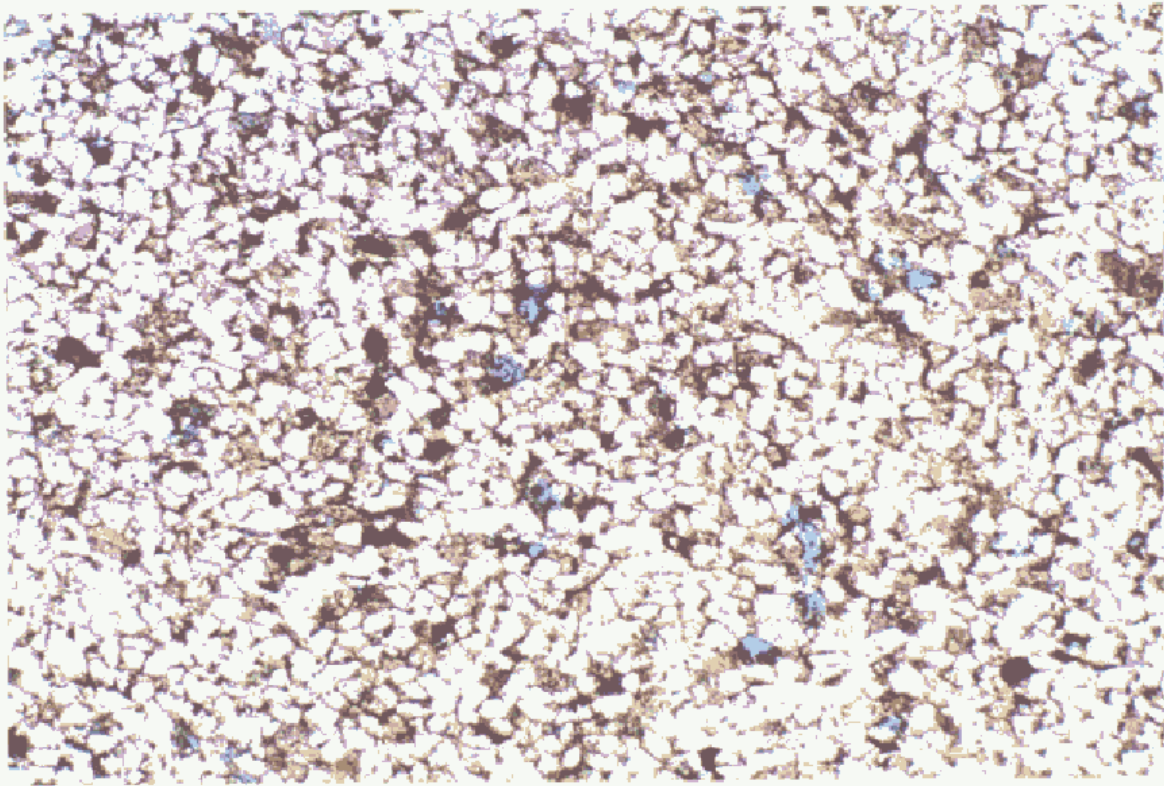
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

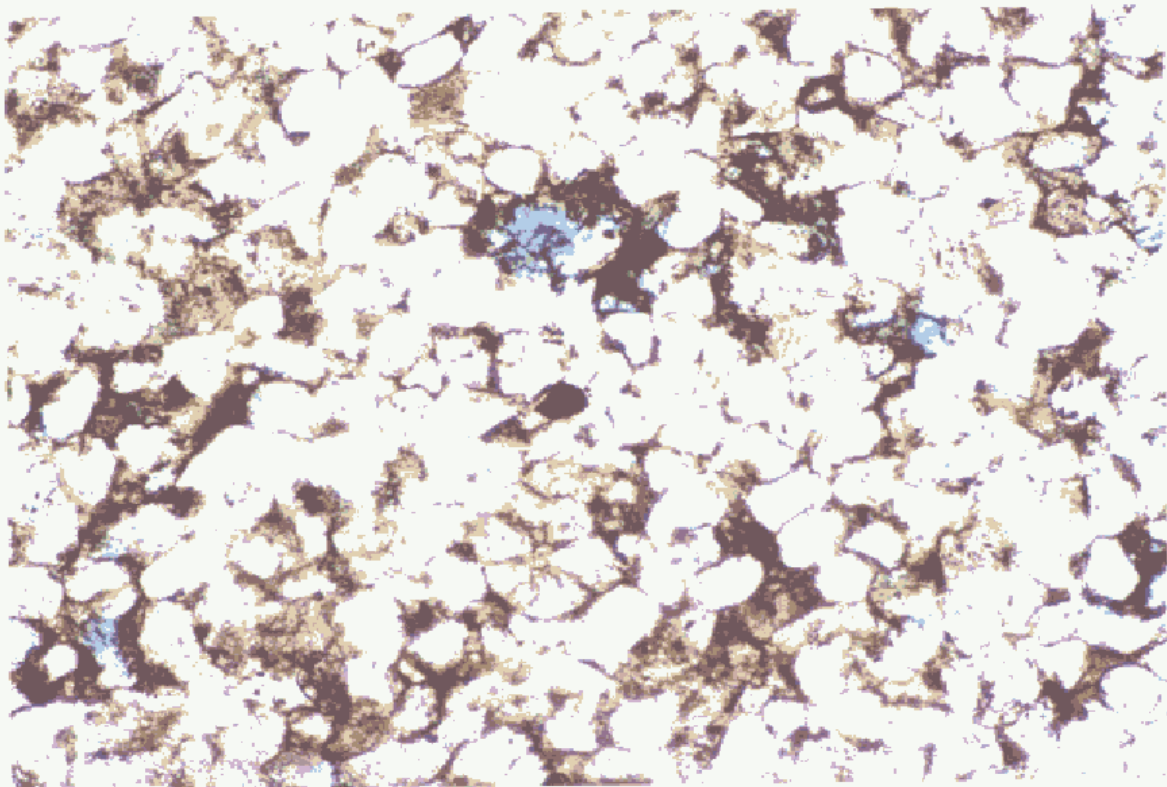
Sidewinder Unit #1H

15993.2'

A

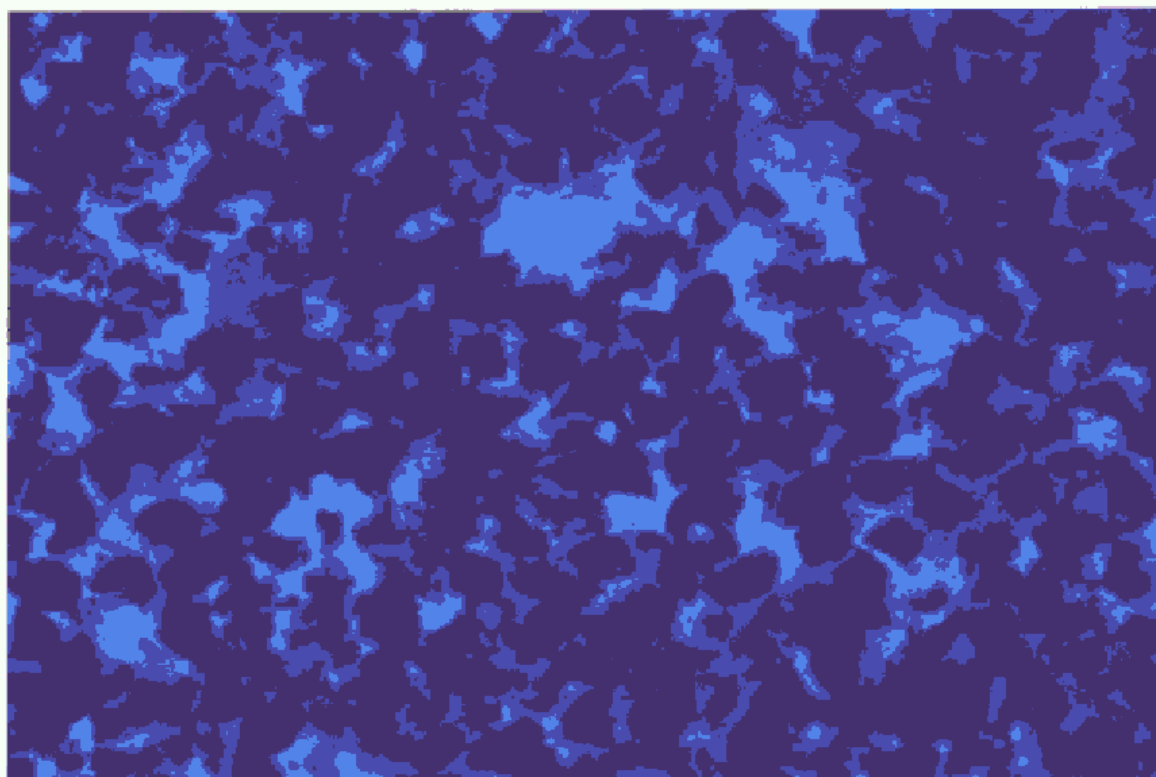


B



Sidewinder Unit #1H

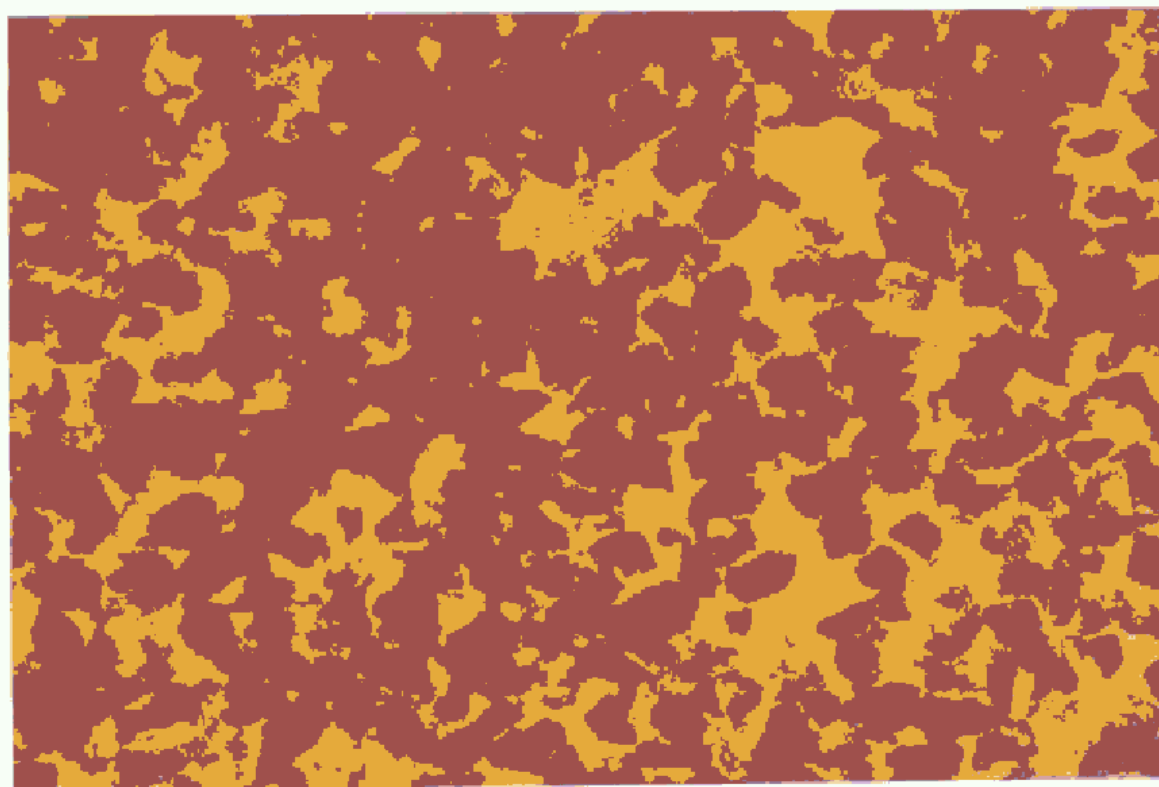
15993.2'



C

X-N

0 125μ



D

E-F

0 125μ

Sidewinder Unit 1H

15998.1'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 87.1%, plagioclase 3.7%, total clays 9.2%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .001md Porosity = 9.6%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.001md) due to abundant clays present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

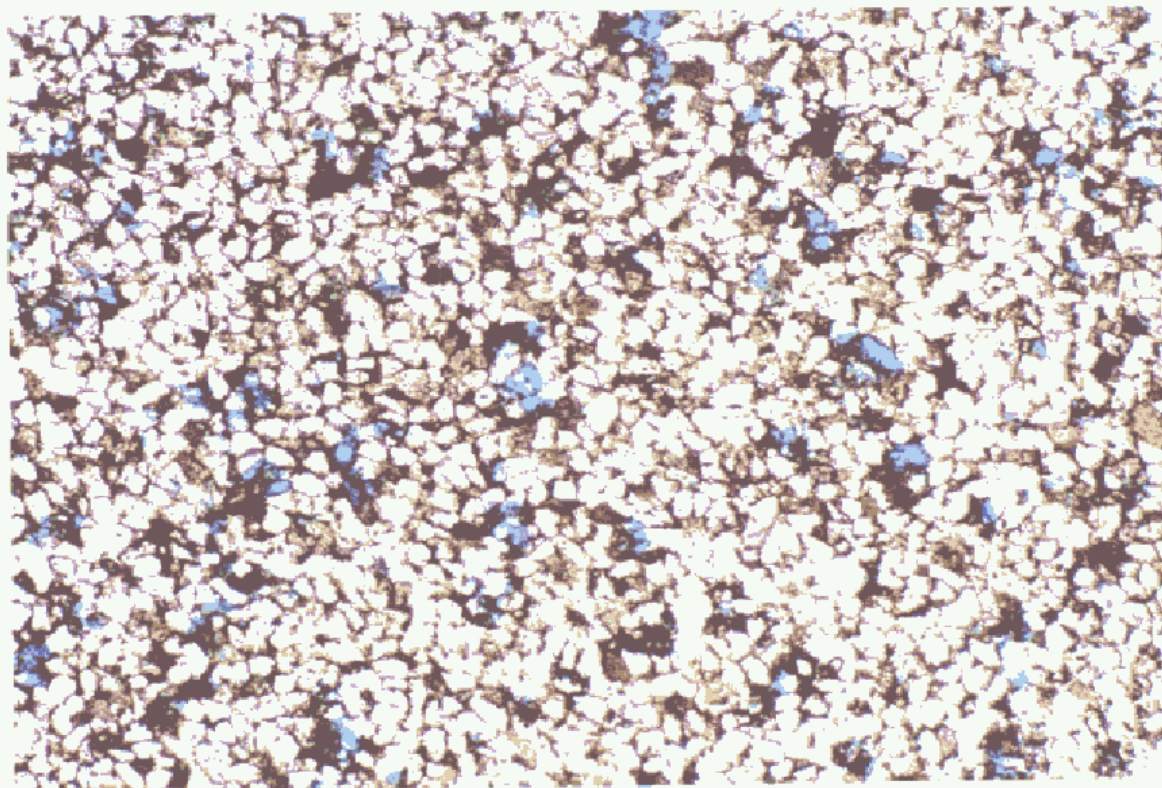
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

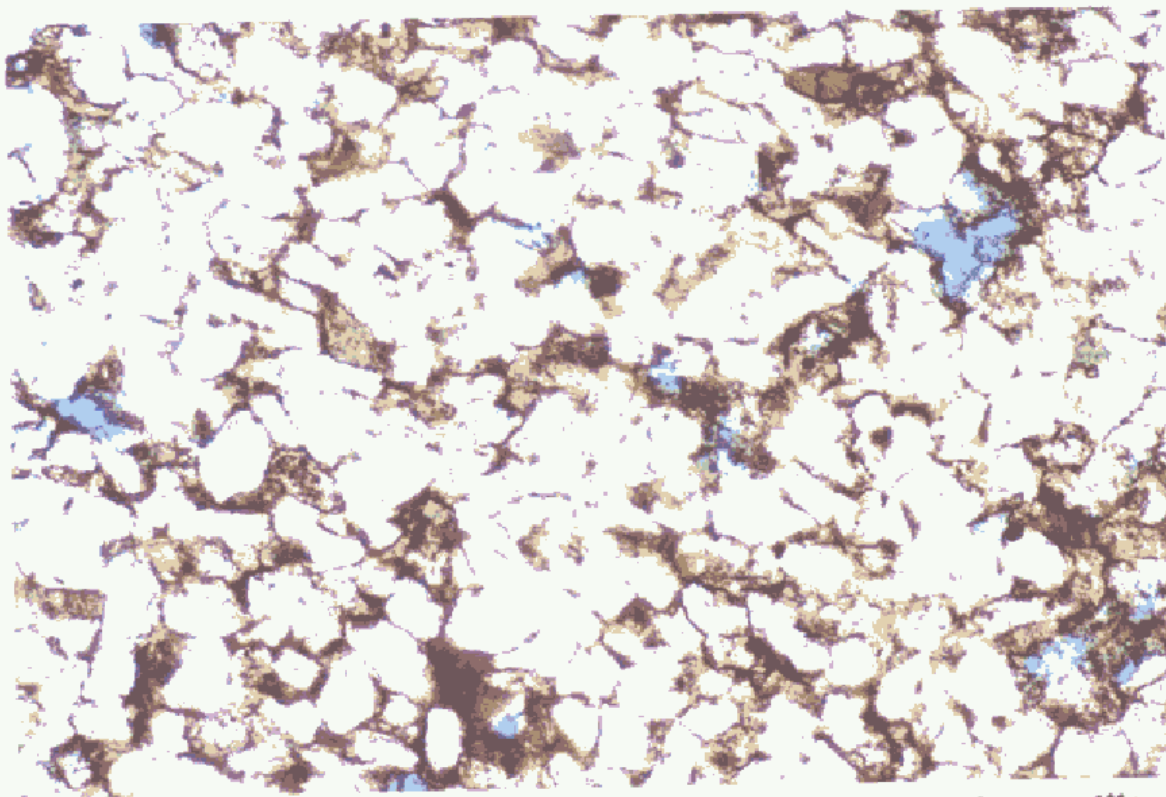
15998.1'

A



0 500μ

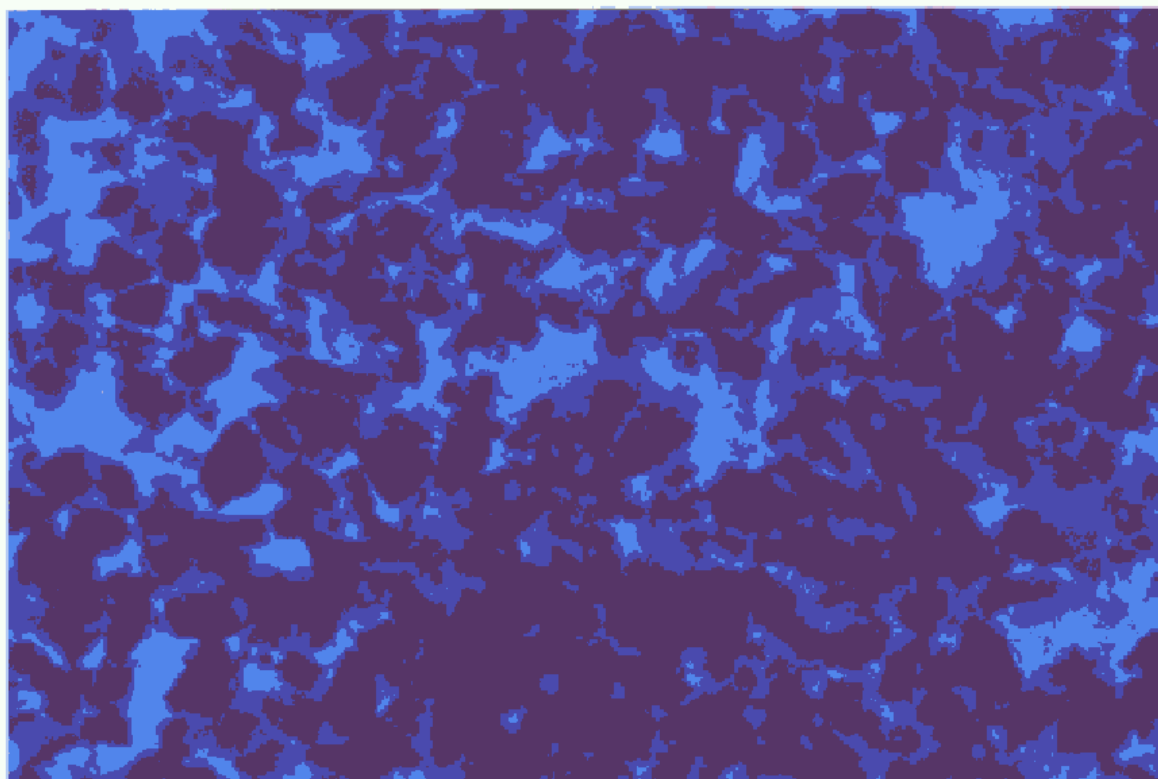
B



0 125μ

Sidewinder Unit #1H

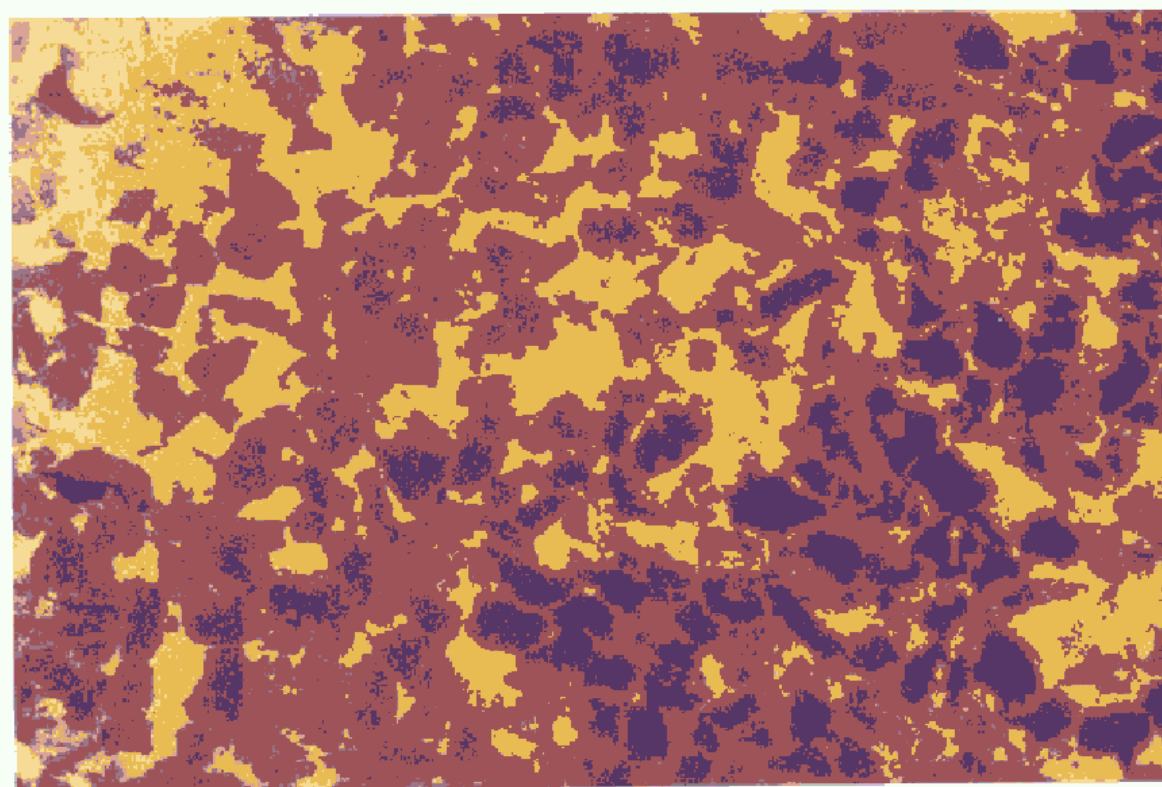
15998.1'



X-N

0 125µ

C



E-F

0 125µ

D

Sidewinder Unit 1H

16002.1'

Massive Sandstone

Sublithic arenite (approximately 90% quartz and 10% lithics)

X-Ray Diffraction: quartz 85.3%, plagioclase 2.8%, total clays 7.9%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .004md perm Porosity = 11.1%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.004md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

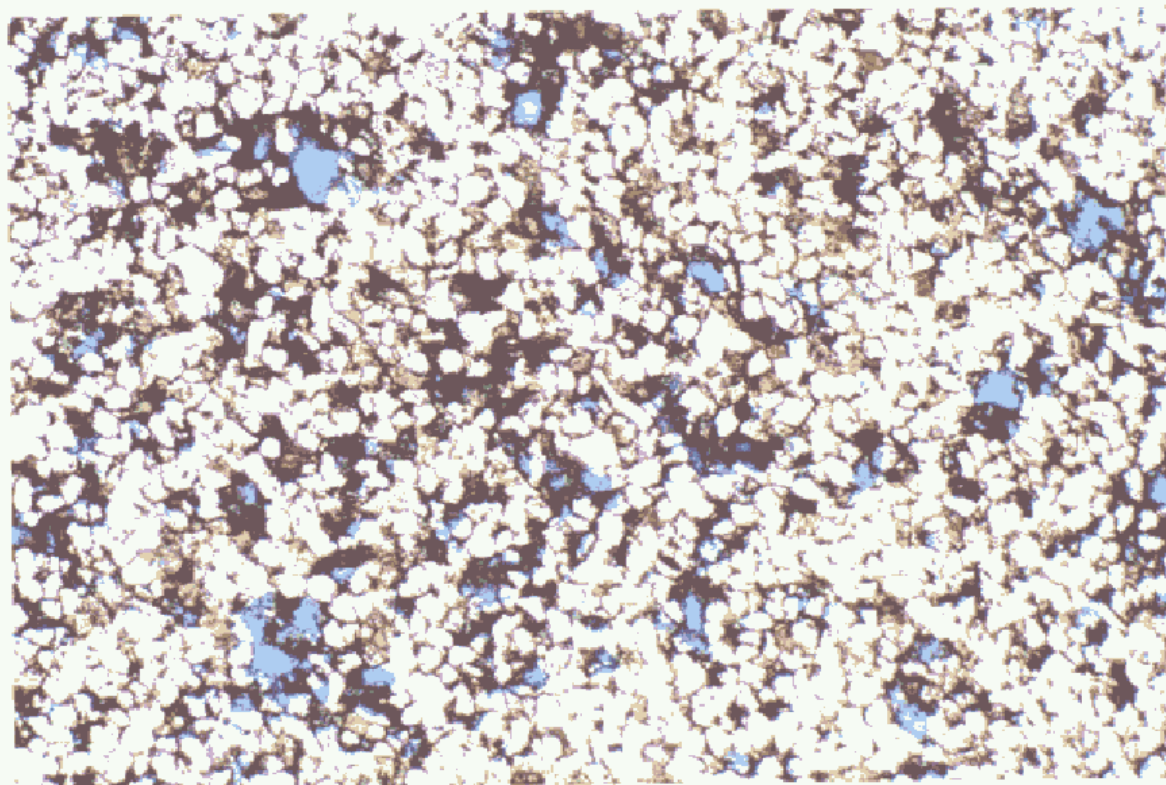
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

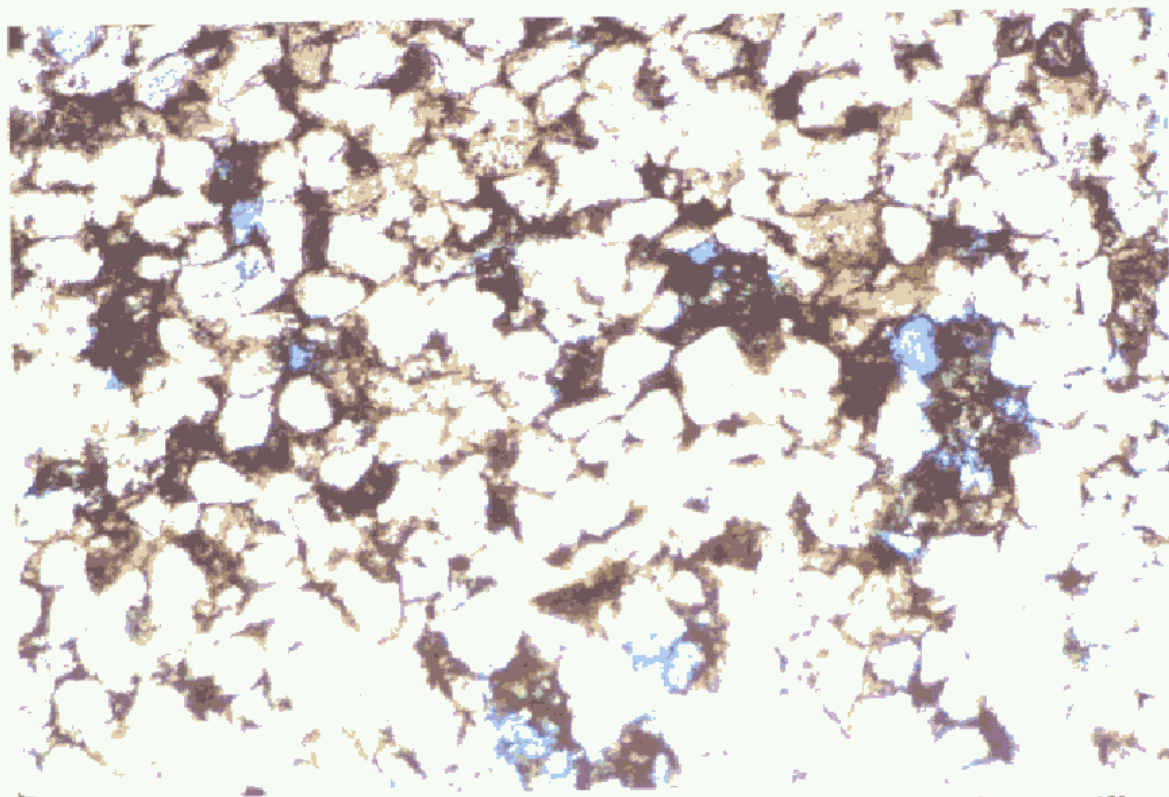
Sidewinder Unit #1H

16002.1'

A

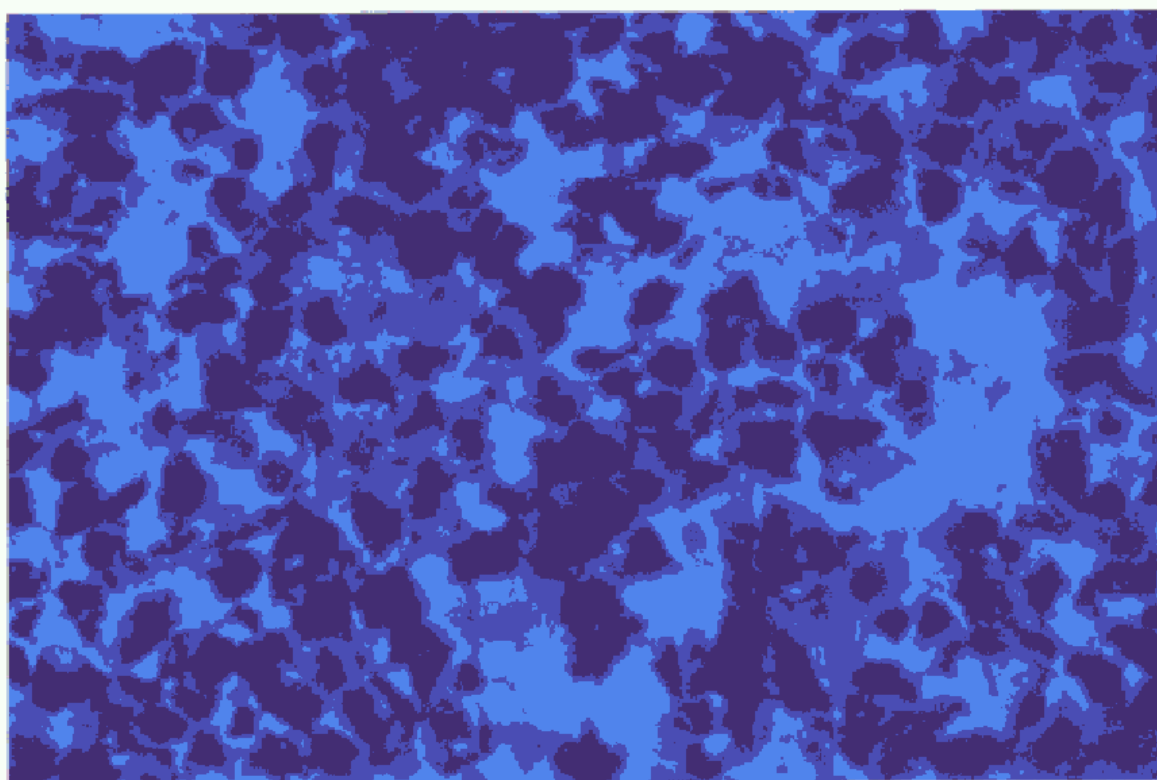


B



Sidewinder Unit #1H

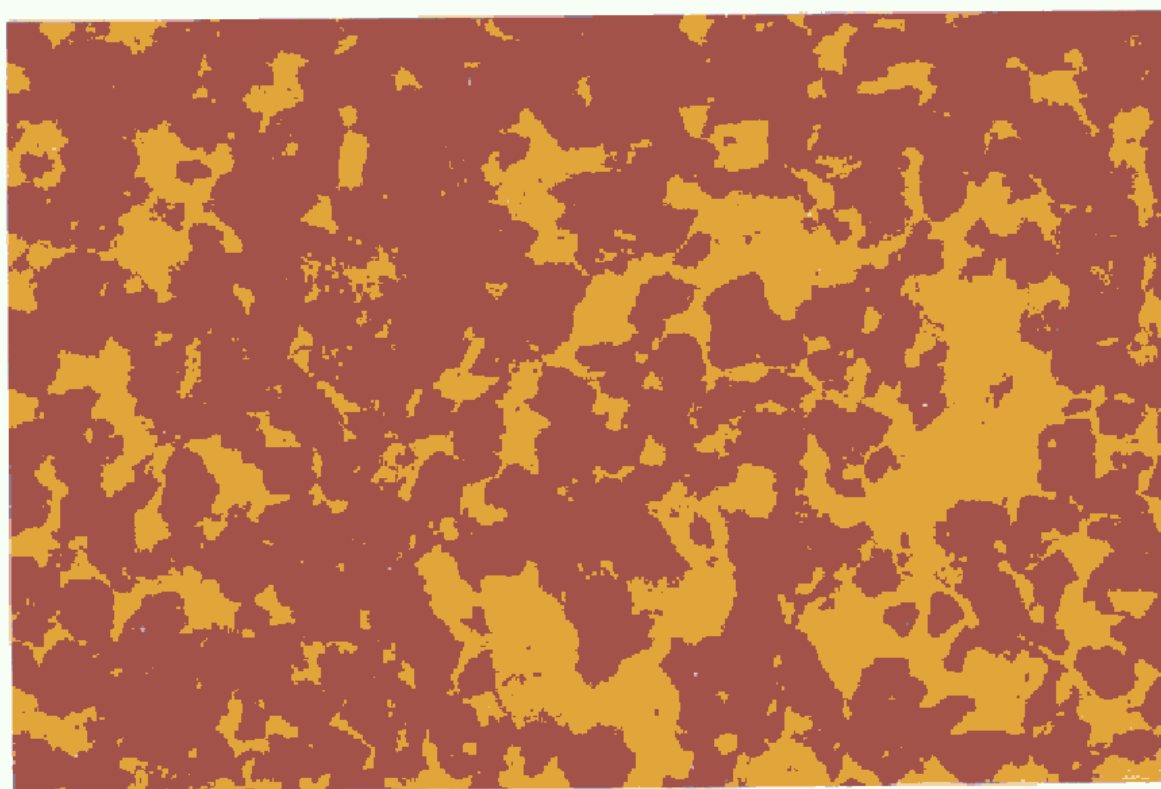
16002.1'



UV

0 125μ

C



E-F

0 125μ

D

Sidewinder Unit 1H

16004.1'

Massive Sandstone

Sublithic arenite (approximately 90% quartz and 10% lithics)

X-Ray Diffraction: quartz 90.6%, plagioclase 1.5%, total clays 7.9%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .002md Porosity = 9.3%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.002md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

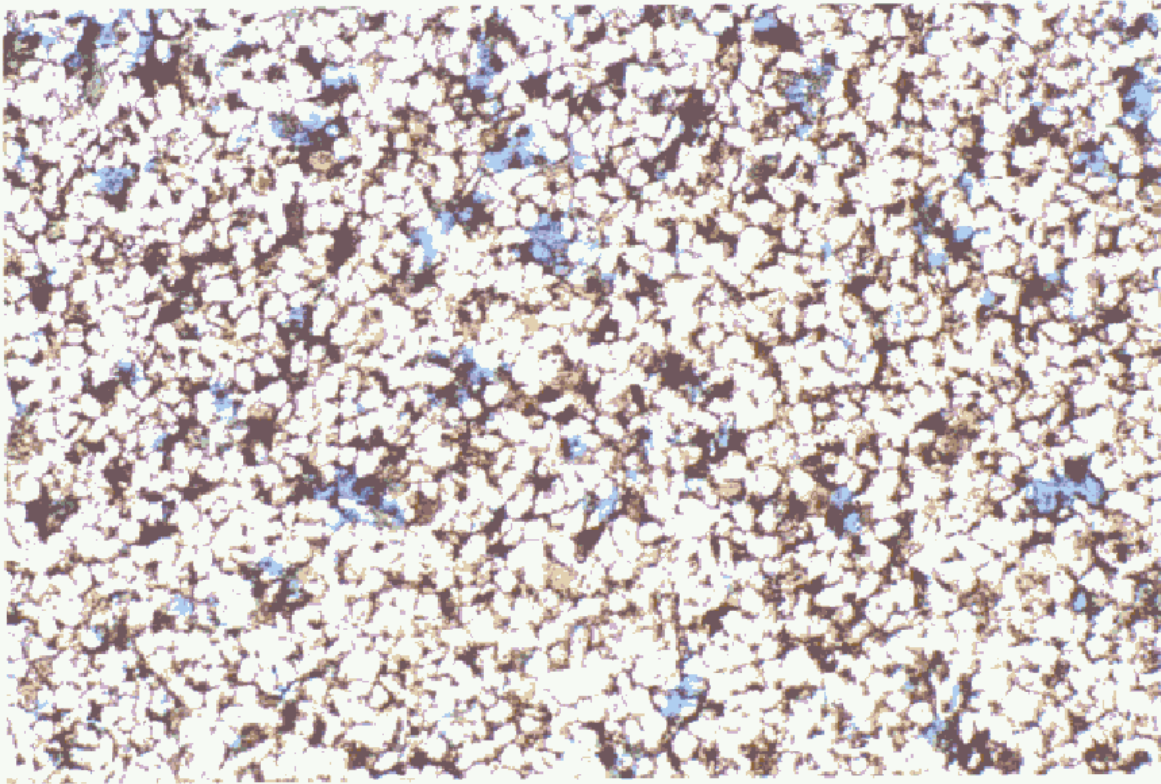
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

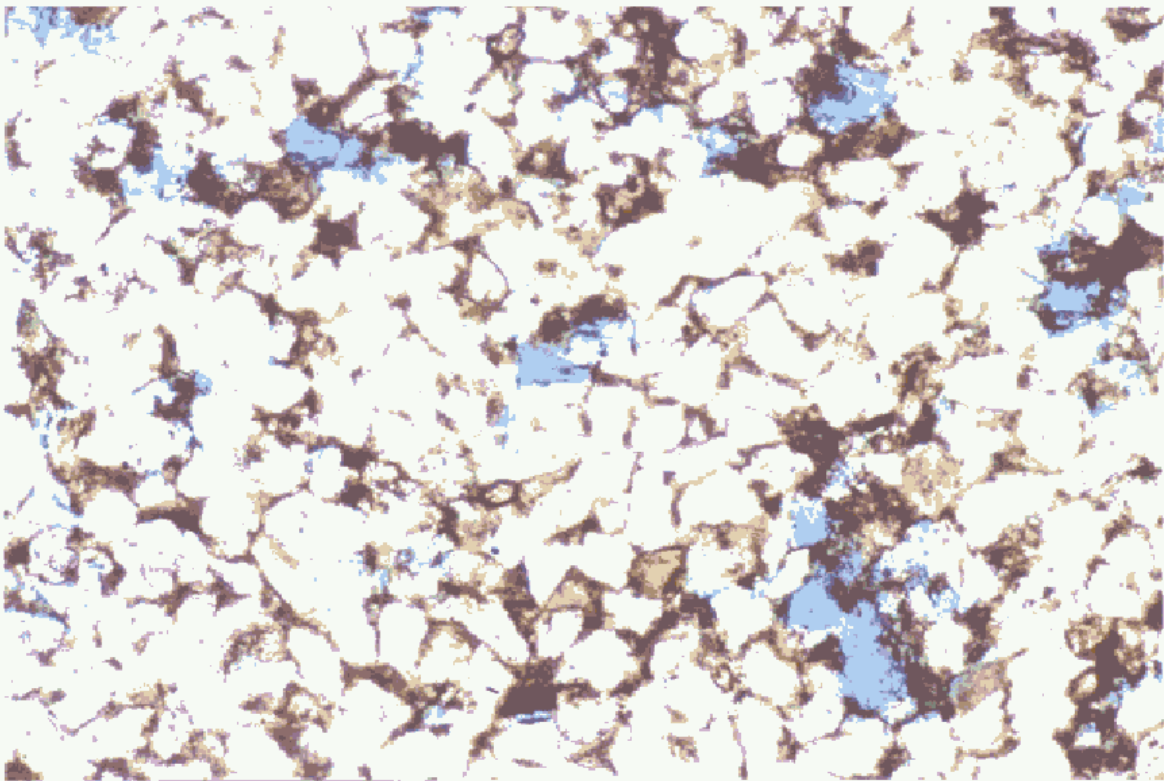
16004.1'

A



0 500µ

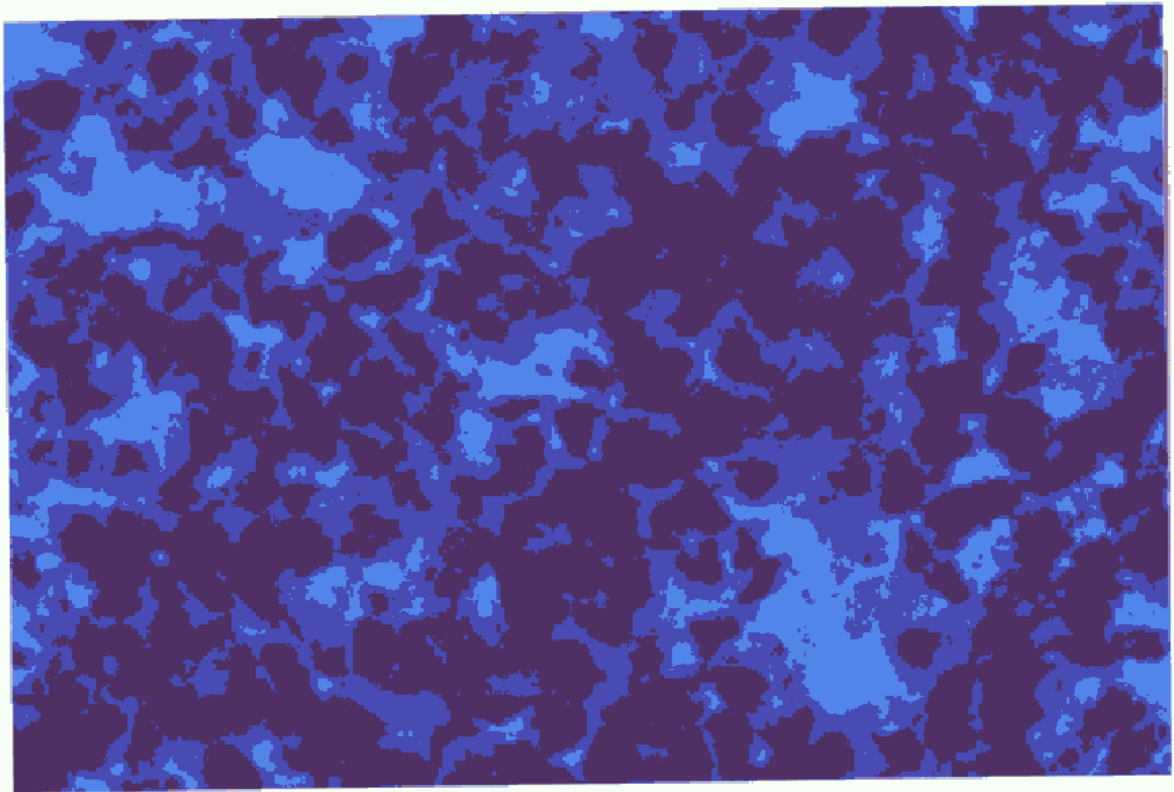
B



0 125µ

Sidewinder Unit #1H

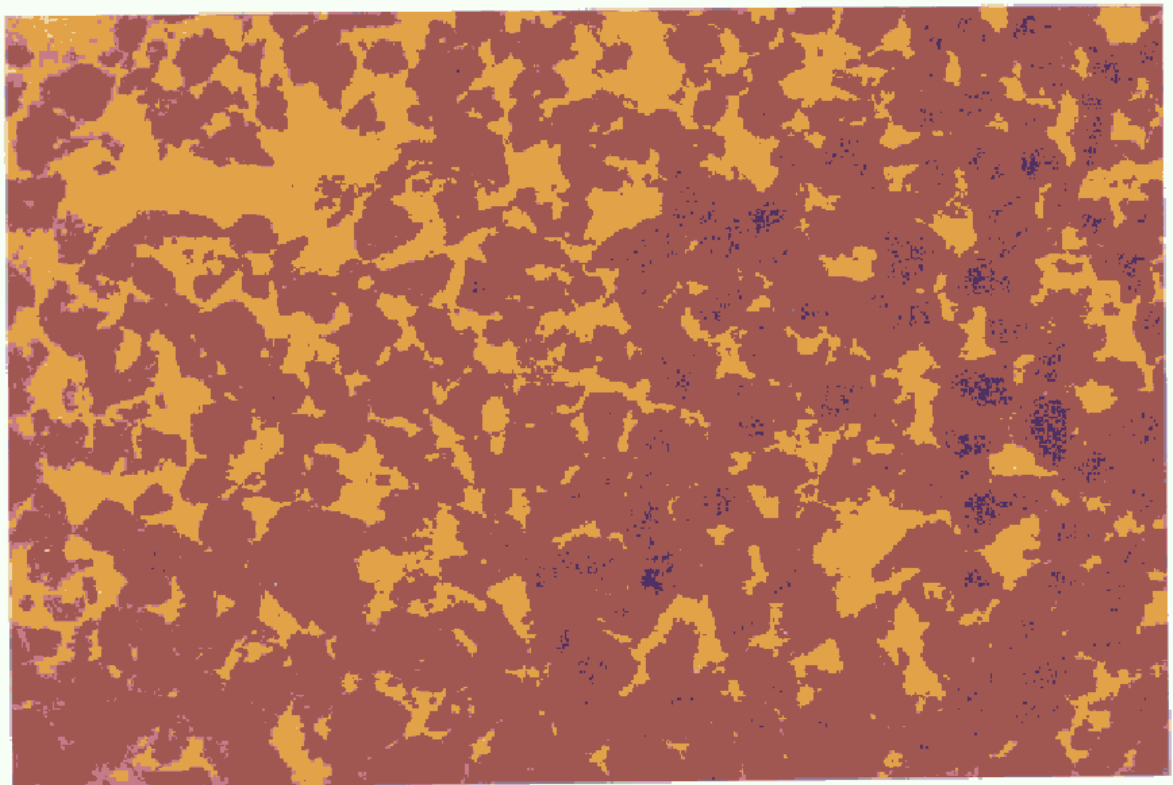
16004.1'



C

UV

0 125μ



D

E-F

0 125μ

Sidewinder Unit 1H

16005.4'

Massive Sand with multiple quartz cemented, partially opened fractures

Sublithic arenite

X-Ray Diffraction: quartz 89.4%, plagioclase 2.5%, total clays 8.1%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .001md Porosity = 11.5%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.001md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

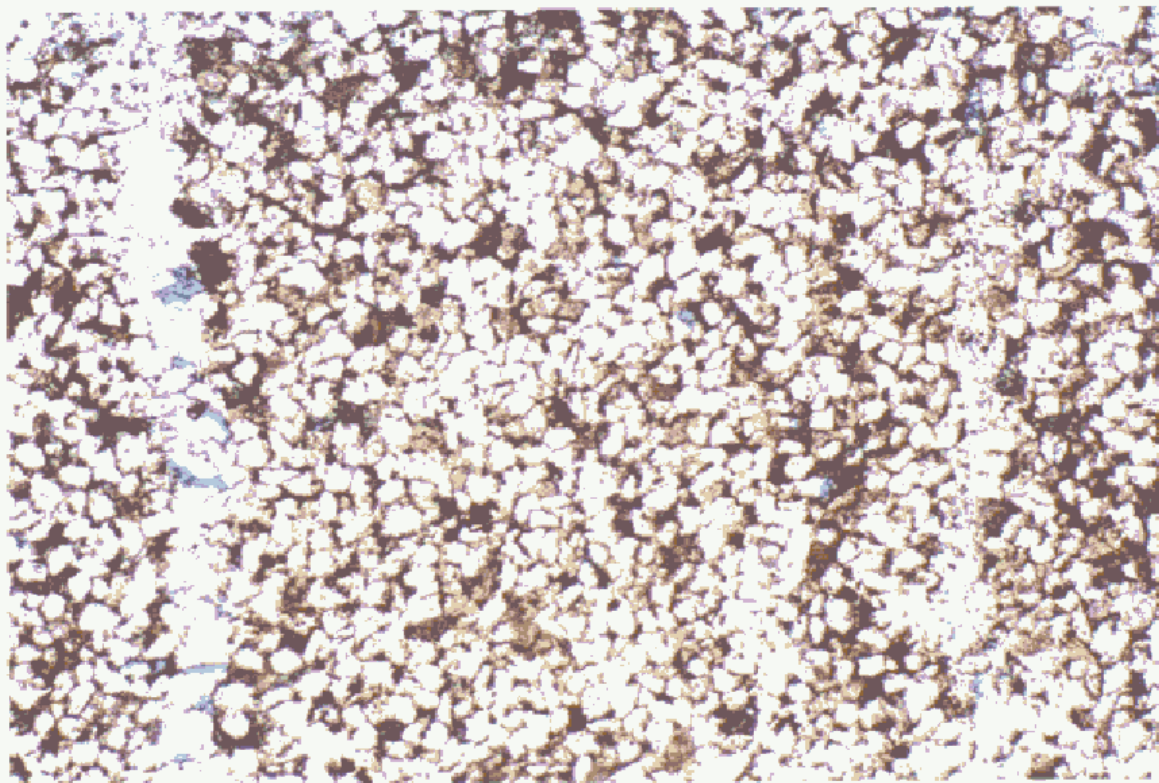
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

Sidewinder Unit #1H

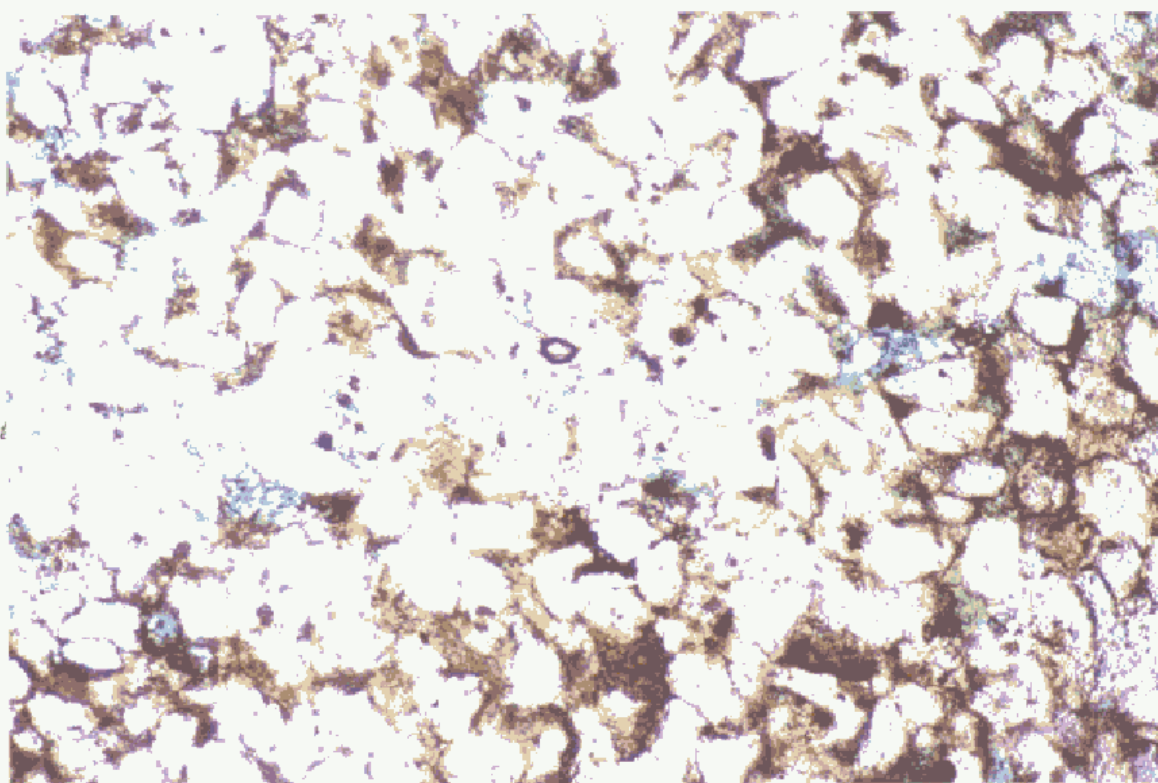
16005.4'

A



0 500µ

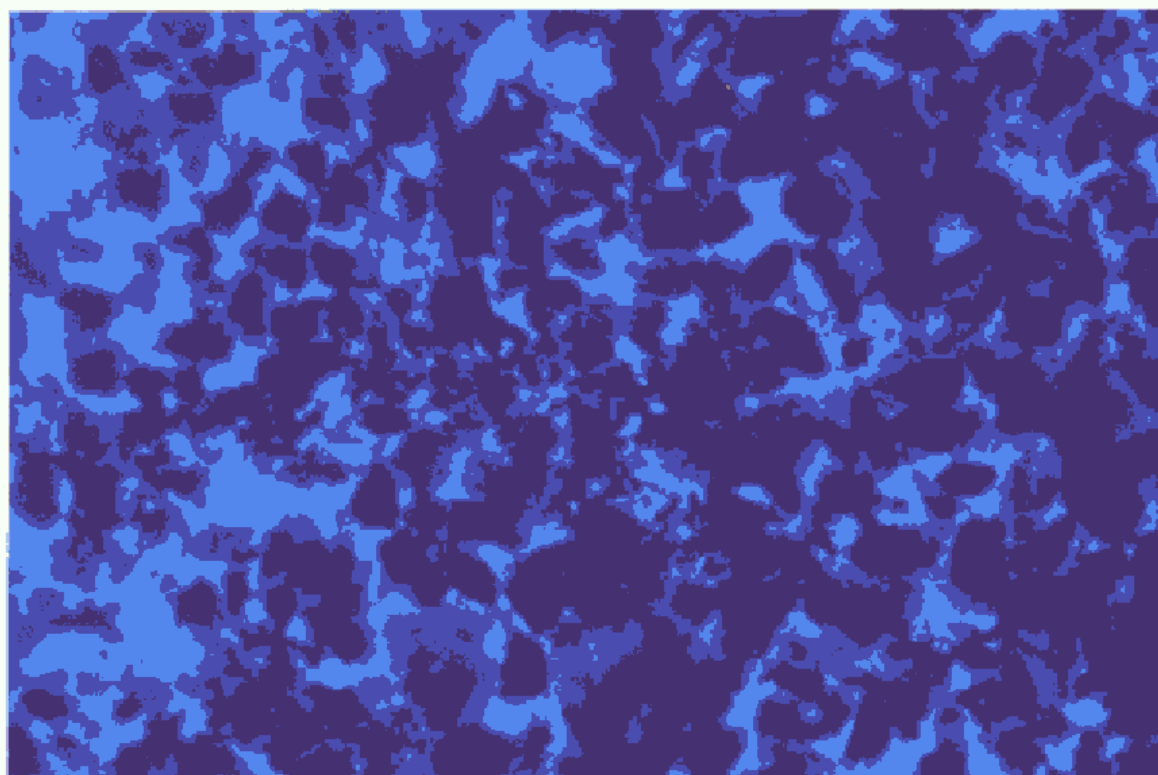
B



0 125µ

Sidewinder Unit #1H

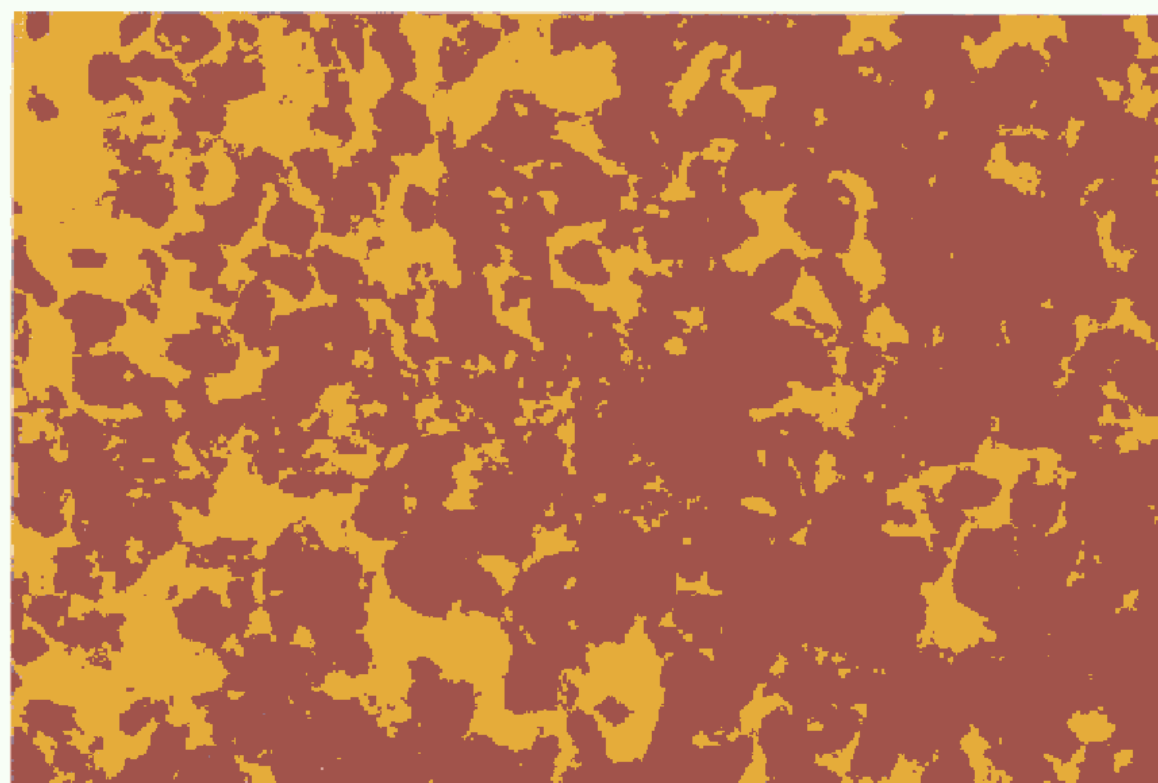
16005.4'



UV

0 125μ

C



E-F

0 125μ

D

Sidewinder Unit 1H

16009.2'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 91.8%, plagioclase 1.4%, total clays 6.8%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .001md Porosity = 7.4%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.001md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

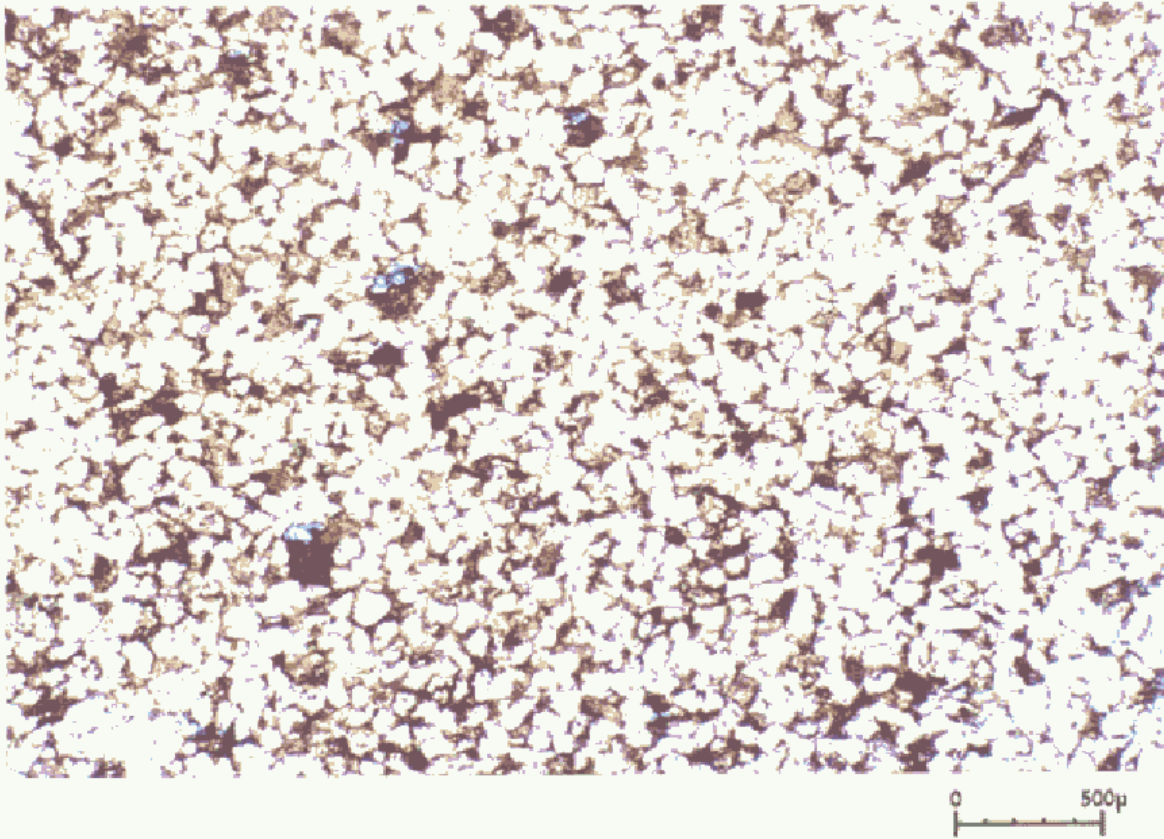
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

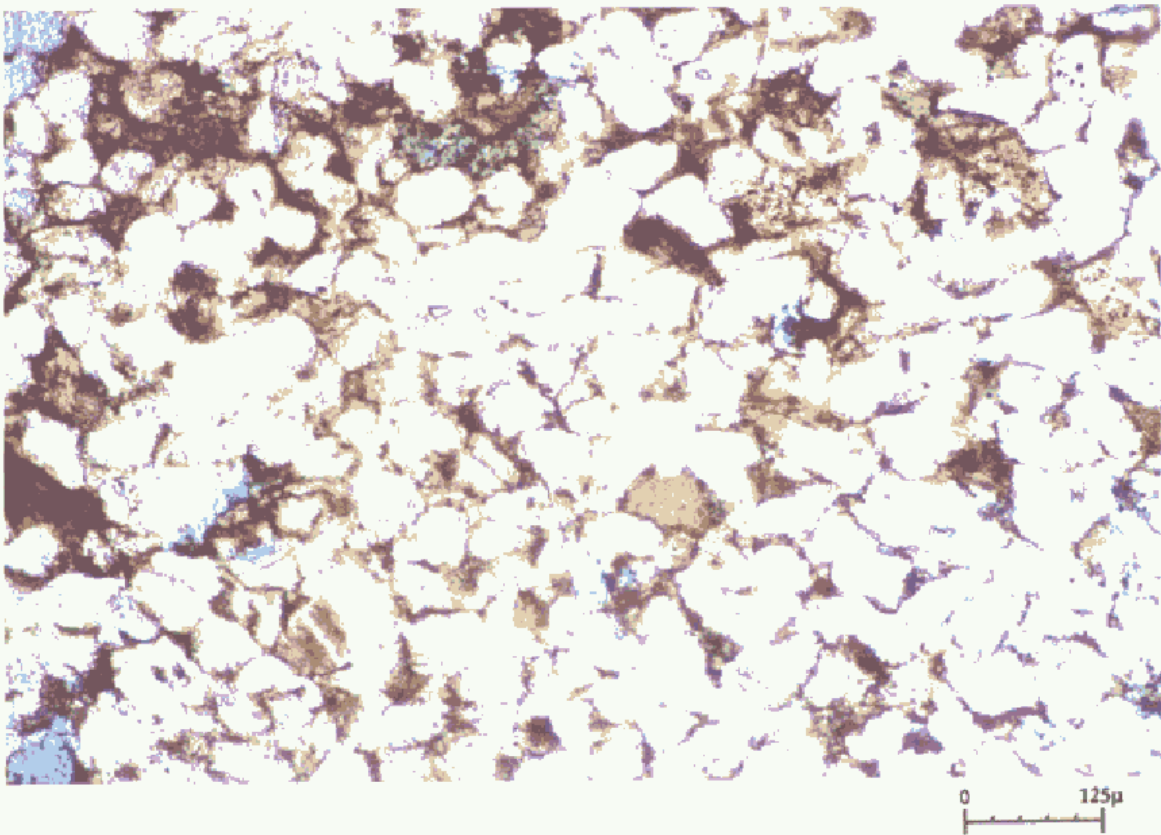
Sidewinder Unit #1H

16009.2'

A

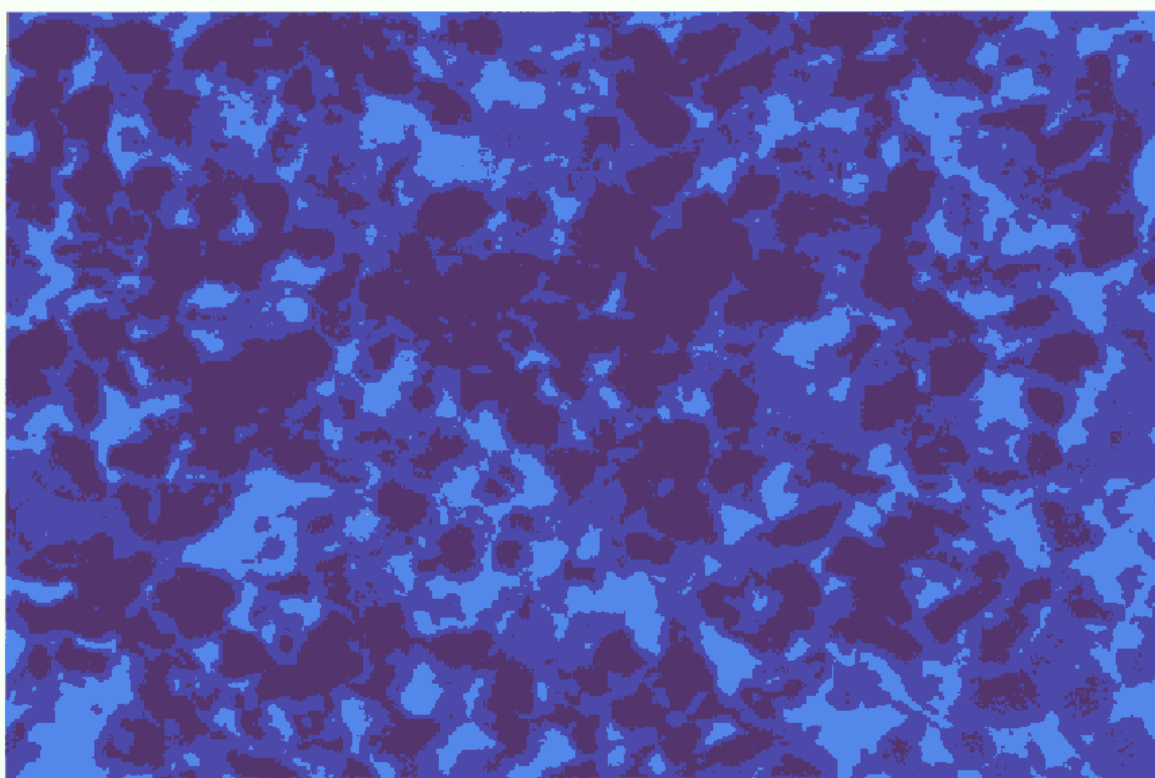


B



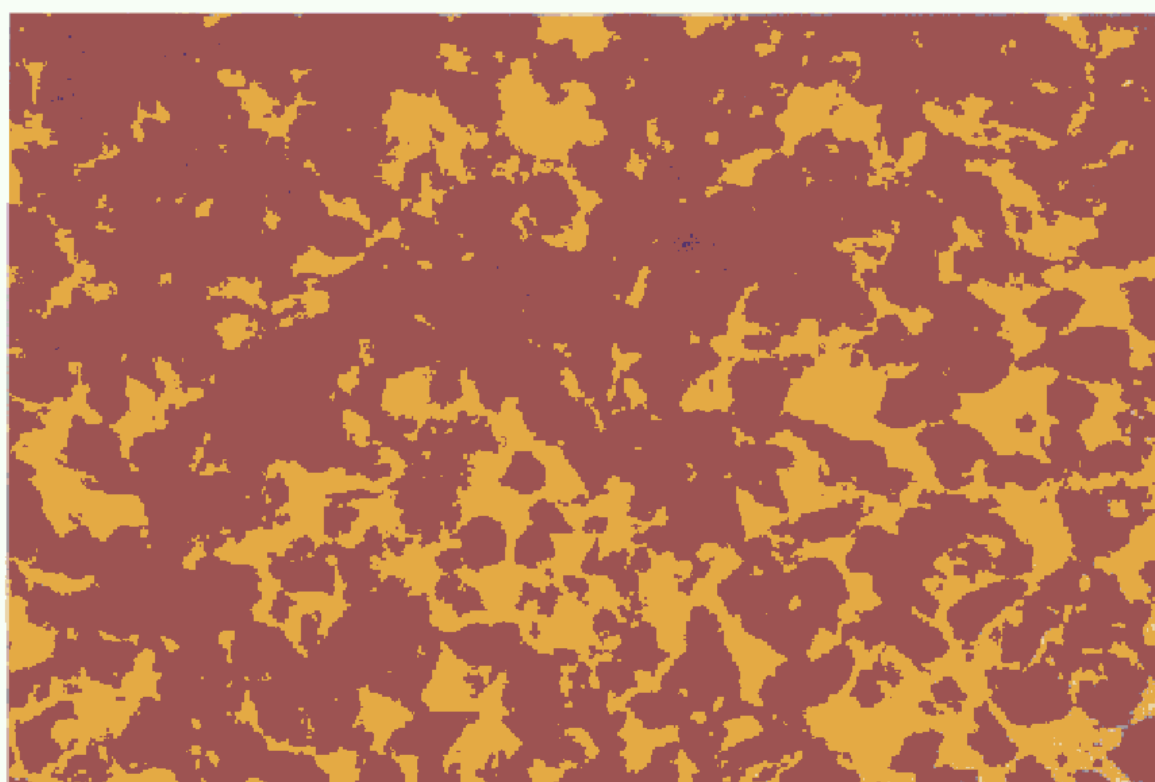
Sidewinder Unit #1H

16009.2'



UV

0 125μ



E-F

0 125μ

C

D

Sidewinder Unit 1H

16015.2'

Massive Sandstone

Sublithic arenite

X-Ray Diffraction: quartz 88.1%, plagioclase 3%, total clays 8.9%

Grain Size = Very Fine (62-125 μ)

Subangular/subrounded

Well sorted

Trace minerals: biotite, muscovite, tourmaline, rutile, zircon, pyrite

Cements: Minor quartz overgrowths

Other: Abundant clays

Permeability = .004md Porosity = 10.4%

Porosity types:

1. Intragranular porosity due to the dissolution of labile grains
2. Micro porosity within clays and chert grains
3. Minor primary intergranular porosity

Comments:

This rock has very little permeability (.004md) due to the abundant clays that are present. However, as shown under UV fluorescence there is micro porosity within the clays. Oil is present and can be observed using epi-fluorescence.

Notes:

Each thin section has an overview photograph at 38.8x magnification (Photo A), and three close-ups at 92.5x magnification (Photos B, C and D) that were taken under plane light, UV light and Epi-fluorescence (E-F).

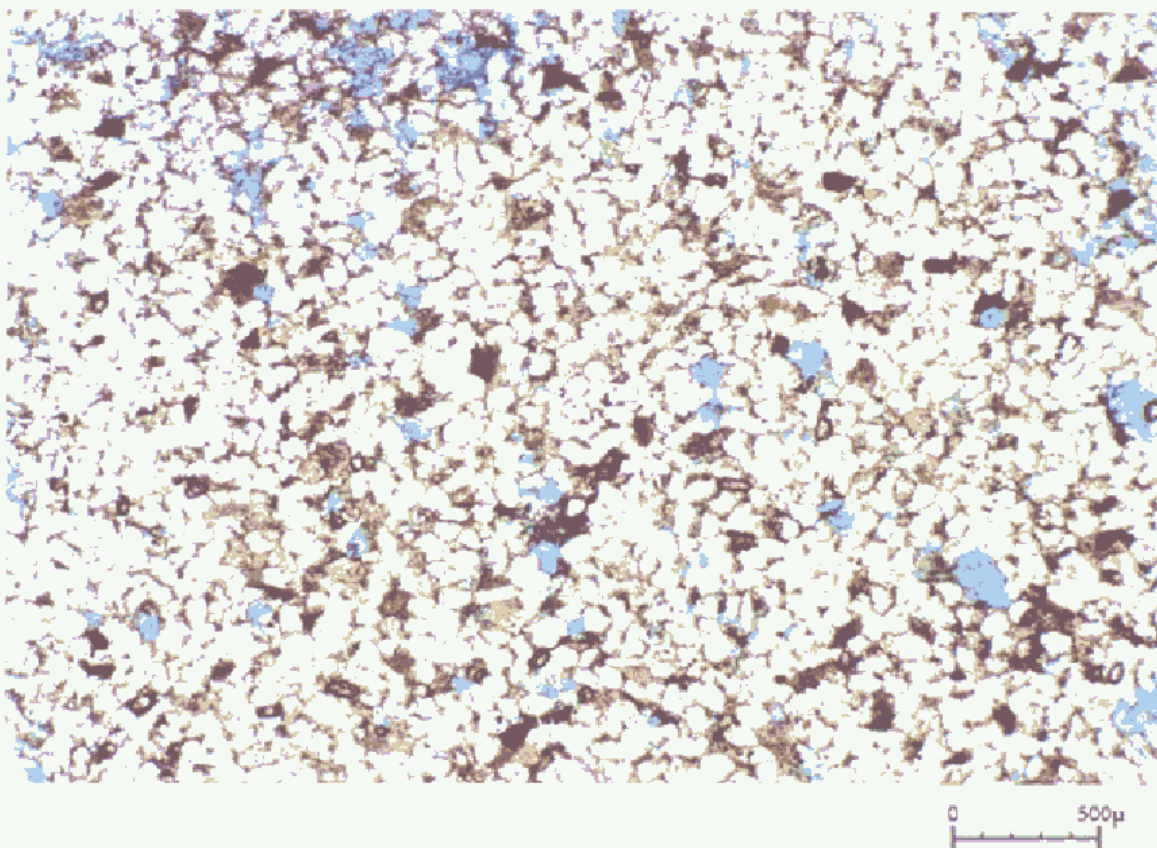
About E-F: Organic materials such as hydrocarbons have a yellow fluorescence when viewed under epi-fluorescence (E-F). The hydrocarbons may not be in-situ if oil based drilling mud was used.

About UV: The thin section was prepared with a spiked epoxy that fluoresces light blue under UV light. Therefore, the brightest blue fluorescence represents the most micro porosity.

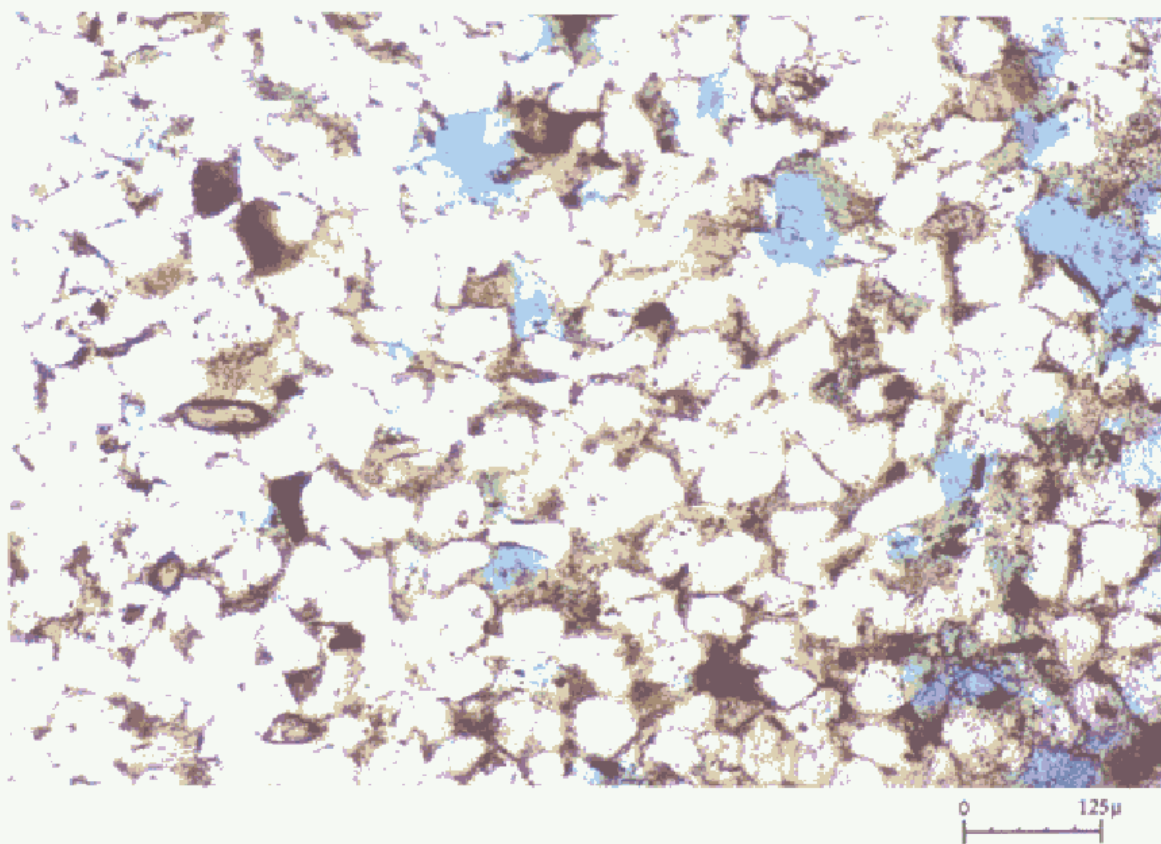
Sidewinder Unit #1H

16015.2'

A

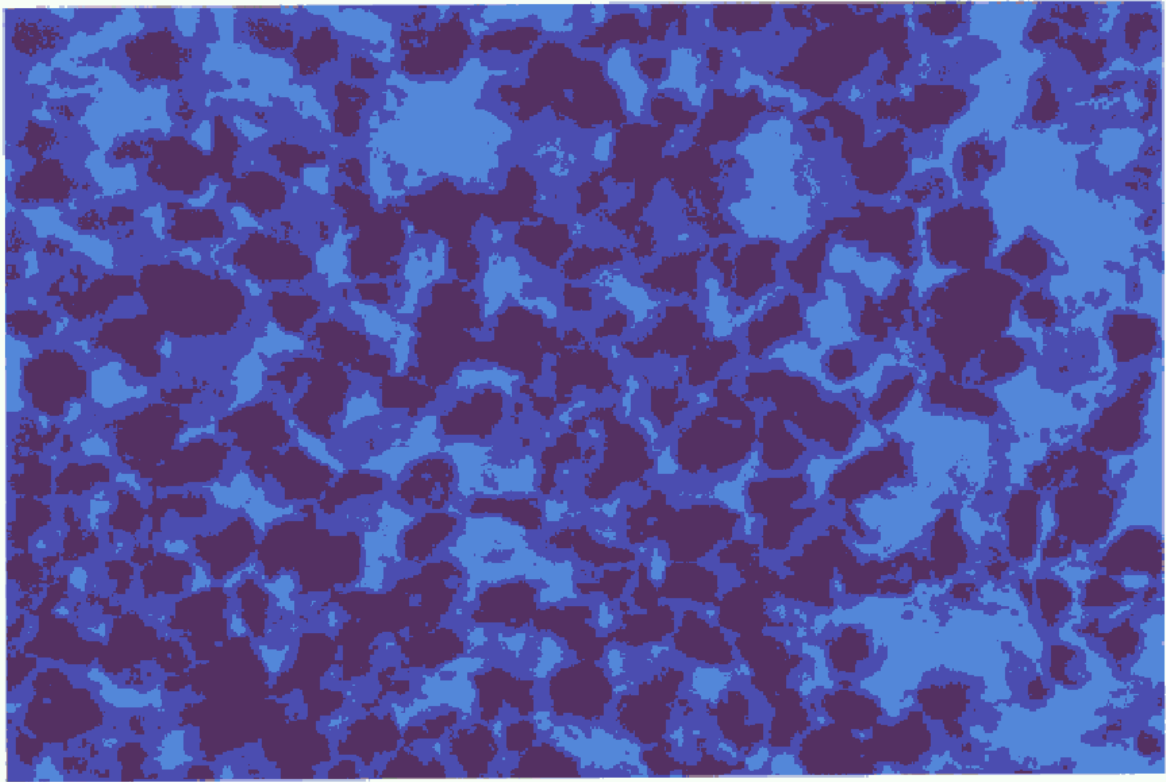


B



Sidewinder Unit #1H

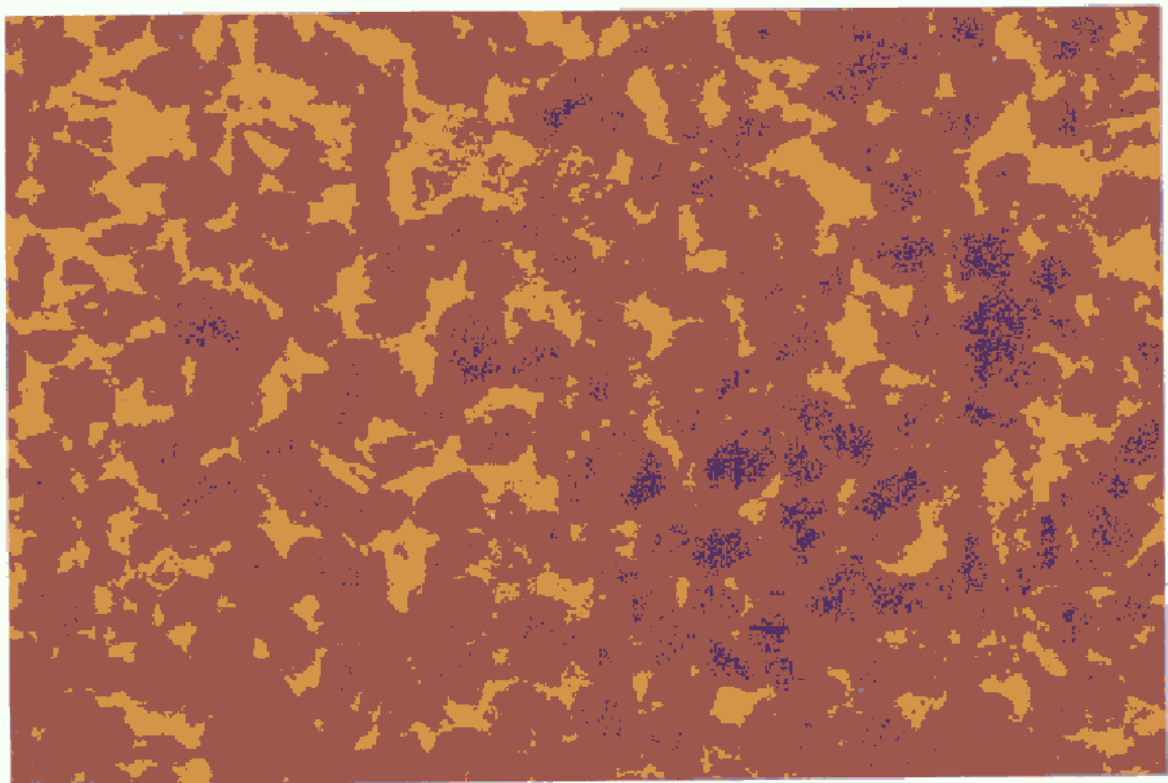
16015.2'



UV

0 125μ

C



E-F

0 125μ

D